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The Tesla Tube. ONE of our English contemporaries, commenting on the convenience that would result from the use of a short name—if one can be found—for vacuum tubes without electrodes, suggests that they be called Tesla tubes. This name is suggested because, although these tubes have been used for years, before Tesla's experiments not much attention was given to them, and because Mr. Tesla has "outstripped all in the brilliant effects which he has produced."

Telegraphers to Join Forces. IT is reported on good authority that efforts will be made by the leaders of the Brotherhood of Railway Telegraphers to unite with their organization the members of the Order of Commercial Telegraphers in such a way that they can work in harmony for the interests of the members of both organizations. It is asserted that the average salary of a commercial telegrapher is, at the present time, not far from $53 per month, and one of the objects of the new organization will be to increase the rate of wages paid to operators. A call has been issued for a convention of the Order of Commercial Telegraphers, to be held in Kansas City on Sept. 2, for the purpose of forming a national organization comprising the local unions that now exist in twenty-seven cities and towns, and it is said that immediately after this convention six organizers will be placed in the field.

Prospect of a Telegraphers' Strike. As we go to press it is reported from Buffalo that the Brotherhood of Railway Telegraphers are considering the advisability of ordering the operators to go out upon a strike along the line of the Delaware, Lackawanna & Western railroad between Buffalo and Scranton, Pa. The cause of the dissatisfaction on the part of the operators seems to be entirely distinct from that of the striking switchmen at Buffalo, and is not to be considered as a sympathetic strike. It is asserted that within a month five members of the Brotherhood at Elmira, N. Y., have been discharged because of their activity in that organization, in each instance the operator being an old employé. A conference is to be held with Manager Halstead at Scranton, at which an attempt will be made to adjust the differences now existing between the company and the Brotherhood. Aside from this difficulty an effort is being made by the striking switchmen at Buffalo to bring about a general strike of railroad employés to support them in their demands on the companies for which they have been working. This general strike, if one should take place, is to include the railroad telegraphers, as well as firemen, engineers and other railroad workers. At the present time, however, there seems to be very little prospect of the success of any such general strike.

The Mt. Washington Search Light. FOR some weeks Mr. L. H. Rogers, of the Thomson-Houston Electric Company, has been engaged in the installation of a huge search light on the top of Mt. Washington and in making preliminary experiments to ascertain the penetrating power of the beam of light sent out from that high altitude. Some definite results have just been obtained which are certainly remarkable. The distance between the source of the light and Portland, Me., in a direct line is about 85 miles, yet telegraphic signals sent by means of the light were easily observed and interpreted by Western Union operators located on the roof of the company's office in that city. Direct telegraphic communication was established between the operator of the light in Mt. Washington and the observer at Portland, so that the interpretation of the signals could be sent back for verification to the operator at the lamp. The beam of light was directed at an angle of 45 degrees above the air line between the two stations in order to avoid low lying clouds. This would make the beam of light at the point observed directly above the city of Portland, not far from 80 miles distant from the observer and the distance in a direct line from the summit of Mt. Washington to the point at which the light was visible, not far from 110 miles. The experiment was reported as entirely successful. The observer read the signals sent by the beam of light easily and accurately, as there were no clouds to interfere with the view.

Insurance Rules Should Be Uniform. THE important meeting of electrical insurance inspectors and experts in this city last week will have far-reaching and beneficial effects if the final result of their labors is indorsed by the various insurance associations throughout the United States. The present state of electrical insurance inspection is extremely unsatisfactory, and this is largly due to the non-uniformity of rules and methods. When one inspector under one set of rules can pass work that another inspector under his rules would have to condemn, the result can only be to bring electrical insurance inspection into disrepute generally, and render the duties of the inspectors difficult and disagreeable to perform. The insurance companies should welcome a measure that will put all their electrical risks under one set of efficient and authoritative rules, and the insured, however he may object otherwise, will be inclined to lend a favorable ear to the electrical inspector armed with rules that cannot be gainsaid. Perhaps the greatest boon will be to the reputable electric light contractors who are now harrowed by the different sets of rules in force and who, under the healthy system the new régime would inaugurate, would have some protection from the hordes of incapables now doing shameful electrical work. Mr. Goddard is to be congratulated upon the work he has inaugurated, and the various insurance associations and companies will, it is hoped, speedily adopt the uniform set of rules to be reported, and take the permanent organization of inspectors and experts under their fostering care.

Electric Locomotives. THERE are very few installations today where electric locomotives drawing passenger trains are in use and fewer still from which the actual figures and reliable data can be obtained regarding the details of operation. For this reason the short article, accompanied by elaborate curves, on the results of actual working of the Siemens electric locomotives on the underground line of the City & South London Railway, which is given in another column, will prove of great interest to electric railway engineers and others interested in this method of rapid transit. The figures presented by Mr. Alexander Siemens in this paper show that with these locomotives of 100-horse power capacity, the efficiency of the motors under widely varying conditions was practically constant at about 92 per cent. The armature speed to secure these results was varied from what would correspond to 12 miles per hour of the locomotive to about 30 miles per hour, and the brake horse power under these different speeds was 110 and 49-horse power respectively. After being put into actual service, the locomotives were thoroughly tested, the average speed being about 13 miles per hour. A study of the curves shows that each locomotive, which fully equipped weighs not far from 13½ tons, when drawing a load of 21 tons exclusive of passengers, required under ordinary running a current of not over 50 ampères, although in starting as much as 140 ampères were used. The violent fluctuations of current called for are shown here as in all curves of this kind that have ever been published, and, as might have been expected, the fluctuations of voltage at the generating station are shown to be not coincident with the fluctuations at the terminals of either one of the locomotives.

Electric Railway Finances. IN connection with our comments on this subject last week it is of interest to note what have been the financial results of the operation of the City and South London Railway. The company operating this underground electric railway has just made a report for the past six months. This report shows that, compared with the corresponding period of 1891, there has been an increase of 20 per cent. in the number of passengers carried and an increase of nine per cent. in the gross receipts, while the expenses have decreased about three per cent. The train mileage for the half year shows an increase of nine per cent., 188,944 miles, as compared with 174,435, while for the same period the running expenses have decreased 13 per cent. The item put down as locomotive expenses, which was 18 cents per train mile when the road was first put in operation, is now 15.5 cents per train mile. This compares very favorably with the ordinary locomotive expenses of the large English steam railways, which vary from 18 to 21 cents per train mile, depending on the cost of fuel. In this case, however, the passenger mileage per train mile is much greater than on the City & South London Railway, where the average number of passengers carried per train run was 45 in the first half year of operation, 46 in the second and 47 in the third. The fare per passenger has been gradually reduced from 3.8 cents to 3.45 cents. Among other sources of revenue the company places the exhibition of its central generating station at Stockwell, around the interior of which a gallery has been built from which the curious public by the payment of a small admission fee may watch the working of the machinery. It is certainly gratifying to know that this road is so successful financially, and that it is advancing so rapidly toward a steady dividend paying position.

No Electric Light Fires in England. SINCE the appearance of the editorial item on fire losses from electric lighting, in THE ELECTRICAL WORLD of July 23, we have published several able articles suggested by it. In the present issue will be found one from the pen of the managing director of one of the prominent English electrical manufacturing companies, which will be read with much interest by American electricians and insurance men. The writer, Mr. Binswanger, points to the fact that in England there has not been a single fire that could be traced to the electric light, and he ascribes this satisfactory condition of affairs to the existence of a uniform system of fire rules and inspection, and the willingness of contractors and electrical companies to work in absolute harmony with the insurance companies and the insurance inspectors. This will be gratifying intelligence to the American electrical insurance experts now laboring to bring about the same state of affairs in the United States, and should be brought to the attention of the alarmists who demand an increased rate for electrical risks. Mr. Binswanger's remarks on American fittings and material are perhaps a little severe. They have reference, we hope, more to work that was done some years ago than to that which is turned out by most of the American manufacturers at the present time. There is, however, we regret to say, some inferior work still being put upon the market, and we hope that Mr. Binswanger's rap over the knuckles will have a salutary effect in letting this third-class of American manufacturer see himself as others see him, to the end that an improvement in manufacture may result. Now that the agitation on this important subject of fire risks has brought fruit in the shape of a preliminary meeting of representative insurance inspectors and experts, with a view to adopting a uniform code of fire rules for the United States, it is hoped that this this pressing—we might almost say burning—question is in a fair way to be speedily settled.

The Rochester Meeting of the American Association for the Advancement of Science.

(From Our Special Correspondent.)

The forty-first annual meeting of the American Association for the Advancement of Science has been in session here for a week, and the meeting has been one of the most successful in the history of the Association. The Section of Physics, before which most of the electrical papers were read, was largely attended.

An interesting paper on "Electromagnetism" was read by Prof. Edward B. Rosa, of Wesleyan University, Middletown, Conn. Prof. Dolbear, of Tufts College, showed some models for illustrating electromagnetic attraction.

Prof J. E. Kershner read an able paper on "Electric Lights for Astronomical Instruments." Prof. Kershner's attention was first attracted to the subject by an article in a German scientific journal. He told of manufacturing the light for his own use by means of a gravity battery. The general excellence of the light and its steadiness for delicate experimentation was shown. "The cost," he said, "is unfortunately more than it ought to be, compared with the prices paid for light when furnished by a dynamo, and this keeps the majority of scientists from using what they really desire."

Prof. Kershner exhibited a number of photographs which showed the conveniences and inconveniences in the use of the light. The only objection of any value raised was the great expense connected with the use of the light. The paper elicited a protracted discussion.

Prof. Whitman, of Adelbert College, read a paper on "Electric Disturbances from Street Railways" before the Section of Physics. *

There were three free excursions Saturday to Niagara Falls, Portage and Caledonia; the local arrangement committee raised $3,000 for the expense of entertaining the visitors, and the scientists had no reason to complain of the city's hospitality.

Rochester, N. Y., Aug. 22, 1892.

Electric Disturbances from Street Railways.†

BY PROF. WHITMAN,
of Adelbert College.

Disturbances were noted for some years at Adelbert College laboratory. A year ago it was suspected that they were due to the electric road passing the college.

The laboratory stands about 500 feet from the railroad. The road has a heavy traffic, and the current in the feeders passing the college averages about 300 ampères, though with great fluctuations.

The first experiment was made by methods used by Ayrton and Rücker in experiments with the City & South London Railway similar to some of those detailed in this paper. Magnetometer and non-magnetic needle, of like shape and weight, with bifilar suspension, were set up and adjusted till periods were the same. Observations of each were taken at intervals for several days. The non-magnetic needle was perfectly steady, the magnet never at rest.

The magnetic field at this distance from the road should be nearly perpendicular, and should affect the needle but slightly. Similar magnetometers adjusted to the same period were set up in the laboratory on the third floor and in the basement, and observed at corresponding times, every ten seconds. Results show that the needles are disturbed in opposite directions, showing that the iron in the building, steam, gas and water pipes, was magnetized perpendicularly.

During all these experiments, passing, stopping and starting of cars was carefully observed, but no relation whatever could be traced between these and the magnetic perturbations.

Also observations were taken after midnight, when cars go by the college but once an hour. The general position of the needle differed by several scale divisions from that in the day-time, showing that there was a permanent deflection due to direction by the current, but the perturbations, erratic swings, changes of zero, etc., were about as great as in the day-time. Hence the disturbances are due mainly to the current acting on the iron in the building, and not to passing cars.

The magnetometer was set up in a barn at a distance of 300 feet from the track. Here there was no iron. The disturbance was about two-thirds that in the laboratory. The influence of passing cars was plainly noticeable. This was perhaps to be expected, as the action of the cars would vary as the distance squared, and not like the line action, simply as the distance.

If conditions had been the same in the barn and laboratory the disturbance in the laboratory should have been three-fifths of that in the barn. Actually it was one and one-half times as great.

As to results:

No magnetic instruments dependent on the earth's field can be used for reasonably accurate work at less than about 1,500 feet from such a railway as the East Cleveland Railway, and the distance must be made greater still if the building in which the instrument is placed is fitted with a system of iron pipes. Mirror galvanometers must use non-magnetic shields and artificial shields, while earth inductors and other similar methods of finding the constant of a ballistic galvanometer must be abandoned.

It is, of course, easy following Sir W. Thomson's lead to devise methods for all such work, which shall be wholly independent of the earth's magnetism.

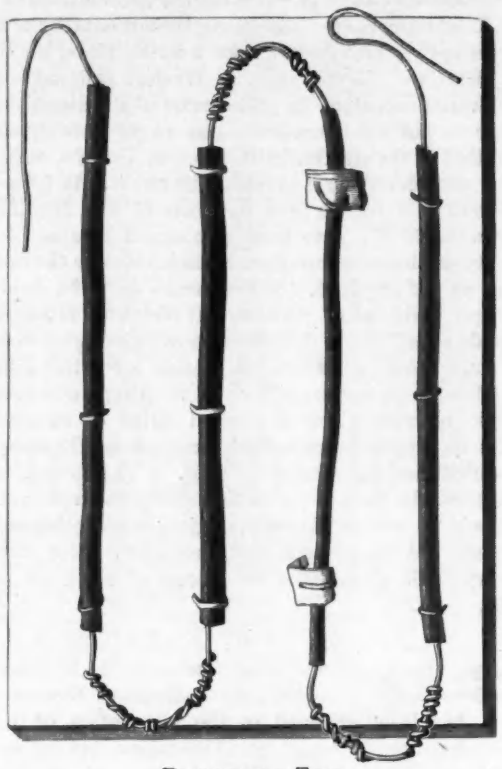
Experiments are now under way for finding the thinnest shield of soft iron which will serve as a complete protection to magnetic instruments under such conditions as those stated above.

* This paper is given in full elsewhere on this page.

†A paper read before the American Association for the Advancement of Science at Rochester, N. Y.

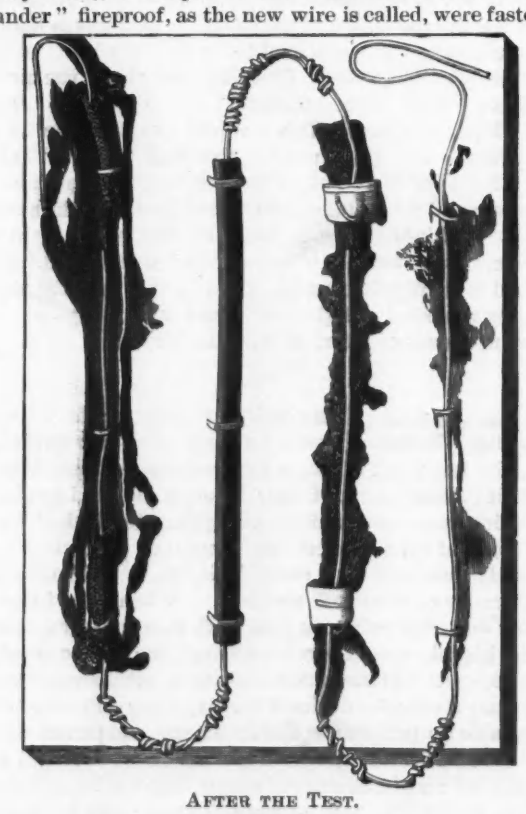
Test of Fireproof Wire.

On Thursday of last week Messrs. Washburn & Moen, through their representative, Mr. C. T. Snedekor, gave an exhibition of the remarkable fireproof qualities of a new brand of insulated wire manufactured by them. The exhibition or test took place at the Pearl street Edison station, in this city, in the presence of the insurance electrical inspectors and experts, who adjourned their meeting to attend. Several other well known insurance men and a number of electrical experts were present, and every one seemed highly pleased with the test.



Before the Test.

From two to four six-inch lengths of various wires, one always being a sample of the Washburn & Moen "Salamander" fireproof, as the new wire is called, were fastened parallel to each other in series on a smooth board and a powerful current sent through and maintained until the insulation of one or more of the wires was destroyed, or until one of the wires fused.



After the Test.

One of the first tests was between a sample of a standard high grade house wire and the same kind of wire covered with the fireproof compound. The wires were 14 B. & S., and after being subjected for three minutes to a current increasing from 25 to 150 ampères, the wires becoming white hot, the insulation of the former was entirely destroyed, while the exterior of the latter remained firm and comparatively cool. An examination after the wire had cooled demonstrated that the "Salamander" had excellently protected the first or original covering of the wire on which it had been used, while the insulation not covered by "Salamander" was so entirely destroyed as to leave the wire practically bare.

Six competitive tests were made with 12 different well-known brands of wire, and in every instance the insulation of all except the "Salamander" brand was either entirely destroyed or so deteriorated as to be useless. In some instances the current was kept on until one of the wires was fused or until the board to which they were fastened was set on fire, but in every case not sufficient heat escaped through the "Salamander" coating to discolor the board underneath it. Under the intense heat all of the wires except the "Salamanader" blazed more or less, including several specimens of fireproof wires, so-called. The rubber or other first coating of the "Salamander" wire seemed to undergo very little deterioration from the great heat.

Our cuts show a board of wires before testing and the same after being subjected to a current of 150 ampères.

Mr. Snedekor exhibited a report of tests made by the Massachusetts Electrical Engineering Co., which showed that after an immersion of 26 hours the insulation resistance of 260 feet of "Salamander" fireproof No. 16 B. & S. was at the rate of 880 megohms per mile.

Meeting of Electrical Insurance Experts.

An important meeting of electrical insurance experts was held last week in the board room of the New York Board of Fire Underwriters for the purpose of discussing and adopting a uniform code of electrical insurance inspection rules and reporting the same to their various associations and companies for adoption.

The idea of such a meeting originated with Mr. C. M. Goddard, secretary of the New England Exchange, who selected the date and sent out invitations for the attendance of electrical and special inspectors.

An organization was effected by electing Mr. Goddard chairman and Mr. H. K. Miller, secretary of the National Board of Fire Underwriters, secretary. On the motion of Mr. Wm. A. Anderson, superintendent of New York Board of Fire Underwriters, the rules of the National Electric Light Association were adopted as a basis for discussion. These rules were taken up *seriatim* and their discussion occupied the morning and afternoon sessions of Thursday and Friday.

The consideration of the rules developed very general discussion and brought out practical points of great value; as was to be supposed, grounding the neutral, the use of molding and insulation tests developed differences of opinion, and the latter was referred to a committee, of which Prof. Geyer, of Stevens Institute, was named chairman, for report.

The concluding session of Friday evening was devoted to general matters, and it was decided to have the inspection rules as amended printed and forwarded to the members present and to the other electrical insurance specials and inspectors in the United States, but not for the present to be made public: comments will be invited, and at as early a date as possible another meeting will be held at which a final set of rules will be reported for adoption and a permanent organization effected.

Those in attendance were:

C. M. Goddard, Secretary New England Insurance Exchange; H. K. Miller, Secretary National Board of Fire Underwriters; Wm. A. Anderson, Superintendent New York Board of Fire Underwriters; E. A. Fitzgerald, Electrical Inspector Underwriters' Association State of New York; F. E. Cabot, Electrical Inspector Boston Board of Fire Underwriters; Wm. McDevitt, Electrical Inspector Philadelphia Underwriters' Association; J. P. Ryan, Special Agent Phenix (Brooklyn) Insurance Company; W. H. Merritt, Jr., Boston Board of Fire Underwriters; A. E. Van Giesen, New York Board of Fire Underwriters; Morton Eden, Underwriters' Association, Middle Department; A. E. Braddell, Underwriters' Association, Middle Department; Edward Leloop, New York Board Fire Underwriters; A. P. Saynes, Baltimore Fire Underwriters' Association; Charles E. Hedge, Special Agent Firemen's Fund; C. H. Lowe, Special Agent London, Liverpool and Globe Insurance Company; F. C. Moore, President Continental Insurance Company; J. H. Washburn, Vice-President Home Insurance Company.

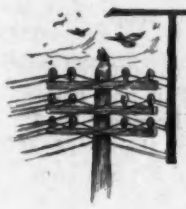
Moonlight Tables for September, 1892.

Herewith we give Mr. H. W. Frund's table of lighting hours for the month of September, under his modified form of moon schedule:

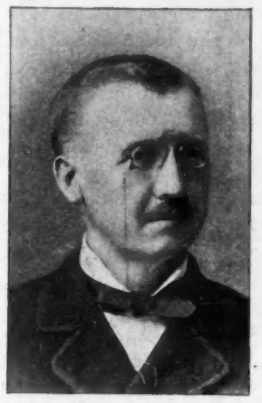
TABLE NO. 1. Standard Moonlight, Philadelphia System.				TABLE NO. 2. Frund's New Moonlight System.			
Date.	Light.	Date.	Exting.	Date.	Light.	Date.	Exting.
1	11:15 P. M.	2	4:30 A. M.	1	7:00 P. M.	2	4:30 A.M.
2				2	7:00	2	12:00 M.
3	12:15 A. M.	3	4:30	3	7:00	3	12:00
4	1:25	4	4:30	4	6:55	4	12:00
5	No light.	5	No light.	5	6:55	5	12:00
6	No light.	6	No light.	6	6:55	6	12:00
7	No light.	7	No light.	7	6:50	7	12:00
8	6:50 P. M.	8	8:35 P. M.	8	6:50	8	12:00
9	6:50	9	9:00	9	6:50	9	12:00
10	6:45	10	9:30	10	6:45	10	12:00
11	6:45	11	10:05	11	6:45	11	12:00
12	6:45	12	10:50	12	6:45	12	12:00
13	6:40	13	11:40	13	6:40	13	12:00
14	6:40	15	12:40 A. M.	14	6:40	15	12:40A.M.
15	6:40	16	1:45	15	6:40	16	1:45
16	6:35	17	2:55	16	6:35	17	2:55
17	6:35	18	4:45	17	6:35	18	4:45
18	6:35	19	4:45	18	6:35	19	4:45
19	6:30	20	4:45	19	6:30	20	4:45
20	6:30	21	4:45	20	6:30	21	4:45
21	6:30	22	4:50	21	6:30	22	4:50
22	6:25	23	4:50	22	6:25	23	4:50
23	6:25	24	4:50	23	6:25	24	4:50
24	6:25	25	4:50	24	6:25	25	4:50
25	7:00	26	4:50	25	6:20	26	4:50
26	7:35	27	4:55	26	6:20	27	4:55
27	8:15	28	4:55	27	6:20	28	4:55
28	9:05	29	4:55	28	6:15	29	4:55
29	10:00	30	4:55	29	6:15	30	4:55
30	11:05	1	4:55	30	6:15	1	4:55
Total lighting hours, 183.55.				Total hours lighting.			

The New Offices of the Western Union Telegraph Company at Nashville, Tenn.

BY W. F. PECK.



THE City of Nashville, Tenn., has always been considered one of the most important telegraph points in the South. Wires radiate to all points in the South and there are circuits in direct connection with all the principal cities east of the Mississippi, including New York. This is due to her geographical position, which is so central that the Federal government selected this city as its central source of supply to its army in the South. St. Louis, Memphis, New Orleans, Mobile, Montgomery, Macon, Atlanta, Augusta, Chattanooga, Knoxville, Richmond, Washington, New York, Cincinnati, Chicago, Louisville and Evansville form a circuit, of which Nashville is the telegraphic centre. In addition to this Nashville has direct connection with all points in Kentucky, Tennessee, Northern Mississippi, Alabama and Northern Georgia.



A. H. STEWART, CHIEF OPERATOR.

The offices of the company in Nashville were destroyed by fire in January and immediately steps were taken to rebuild the block in which the office is located, and to equip the new telegraphic plant thoroughly in a manner in keeping with modern telegraphy. The company has just moved into its new quarters and the accompanying illustrations show how completely this purpose has been carried out. No expense was spared either by O. F. Noel, the landlord, or the Western Union Company. The matter of designing and estimating the electrical and operating department was placed in the hands of Mr. A. H. Stewart, chief operator, who has for twelve years held this office at Nashville, and who has been in the company's service nearly thirty years. He went to work with the full understanding that he was to apply all modern improvements to his department.

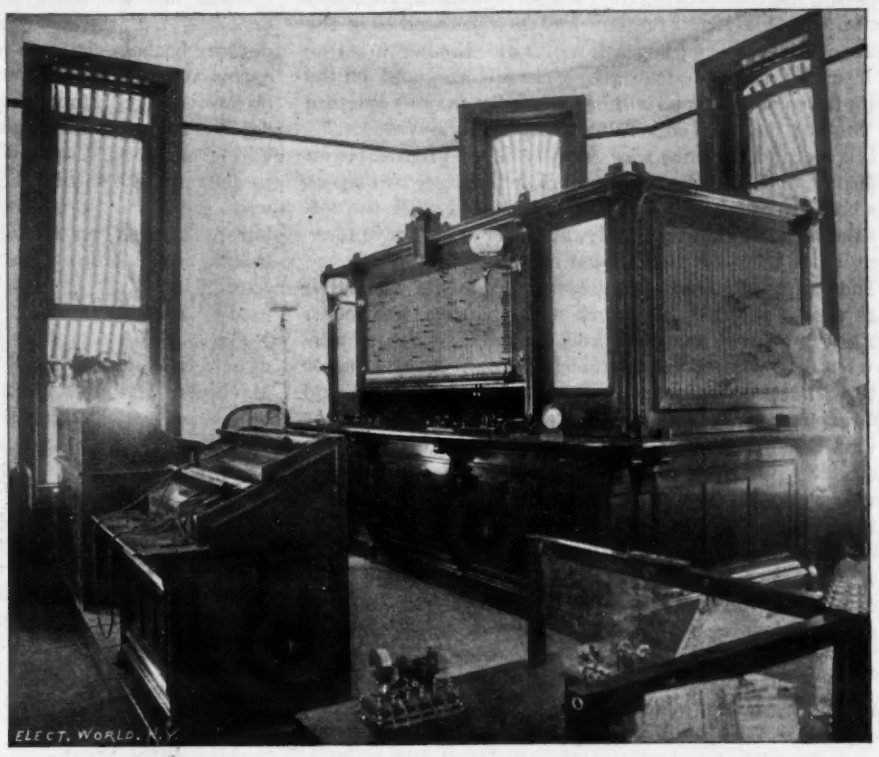
The operating room is, in consequence, excellently fitted up. The machinery and instruments are of the latest design and most substantial quality. The tables and other fittings were made from special drawings to suit the dimensions and peculiarities of the rooms. The switchboards and fittings were made from special designs by Mr. Stewart, and are models of their kind. The casing is of quartered oak, with elaborate paneling and fittings in plate glass. It is twelve feet long and eight feet high at the front, including the support. It runs back at one end a distance of eight feet. There is one board which accommodates fifty wires, on which the multiplex batteries are handled. The main line board accommodates seventy-five wires, and is fitted up with double spring-jacks.

The arrangement of the boards is such that all the connections and their parts are exposed and the operator in charge has every part of them in full view at all times, including the lightning arresters and fuses.

There are ten octant tables finished in ash and walnut and with plate glass partitions so arranged that there is no possible confusion in sounds from the different instruments, a very important point in the telegraphic service. These occupy a part of the operating room, which is 36 × 43 feet in its dimensions, leaving considerable space for future growth.

The equipment of the operating room consists of 11 sets of quadruplex instruments, two polar duplexes, four sets of Hicks-Milliken automatic repeaters, three sets of repeaters for working single lines into the multiplex circuits, 19 Morse instruments for single wires, and two combination sets designed by Mr. Stewart for the prompt handling of specials and other newspaper matter where quick transmission and prompt service are required. By this arrangement one operator can transmit to any number of newspaper offices located in different cities the same matter at one sending. Behind the switchboard is located the galvanometers and testing instruments, and an instrument used in transmitting time, which is received from the naval observatory at Washington and distributed over the various circuits leading into the office at 11 o'clock every day. Adjoining the operating room is located one of the two battery rooms, 34 × 17 feet; the second room is immediately underneath. These two rooms contain 6,000 cells.

The 129 wires are brought into the third story of the building in a novel and ingenious manner. The office pole, painted white, stands in front of a window which is at the end of a switchboard. On this pole, a few feet below the wire and a few inches below the level of the window, there is a fixture resembling the cross tree of a ship's mast. Upon this a platform has been built, and a walkway extends to this platform from the window, with a hand railing of gaspipe, affording easy access to a cable box, which extends from the platform to the top of the pole. The wires are carried into the office from this pole by seven cables passing under the window and floor to the switchboard.



THE WESTERN UNION TELEGRAPH OFFICE AT NASHVILLE.

Precautions have been taken to protect the office from lightning and the heavy currents of the street railway and other electric wires. Three arresters and a fuse will contend for mastery with any invading current before it can reach a point where it might do damage. The first arrester is in the cable box on the pole. Then follows a fuse and another arrester behind the switchboard, and a *final* arrester which is placed upon the table.

All the wiring inside the building is in cables protected by heavy coverings of india rubber and other non-conducting substances. None of these are seen, as they pass through channels in the floor to the tables.

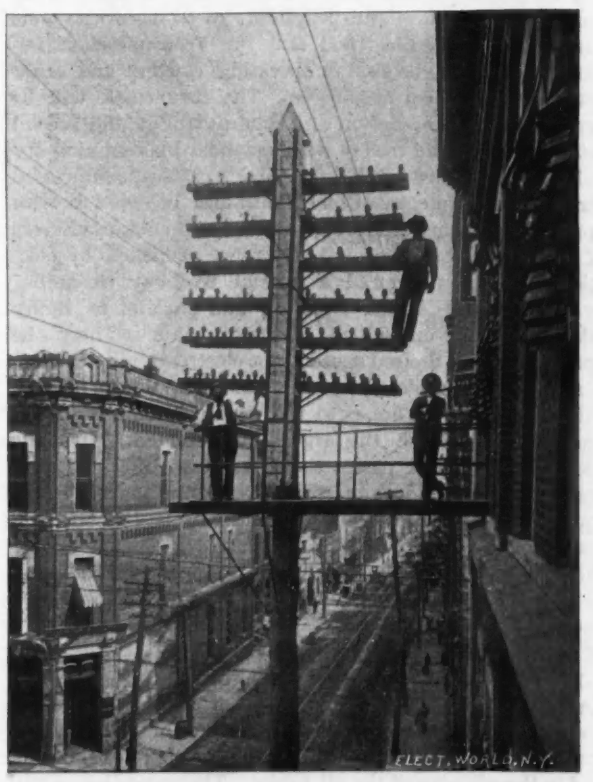
The apartments are equipped with gas and electric light. Besides the ten windows fronting on Church and College streets there are five ventilators in the ceiling. Every precaution has been taken for the health and comfort of the operators. There are two under rooms on this floor for the lady and gentlemen operators.

Altogether it is one of the most complete and handsomest telegraph offices in the United States, and is a credit to the company and to Nashville, as well as to the designer, Mr. A. H. Stewart. This gentleman was selected by the company's superintendent, Mr. James Compton, as in every way capable of satisfying the demands of the company, and who could, if necessary, add new and valuable features.

Superintendent Compton has under his charge about 600 offices, of which Nashville, Louisville and Memphis are the chief. Mr. Compton's district embraces the greater part of Kentucky, all of Tennessee, Mississippi, Louisiana and a part of Alabama. His headquarters are in Nashville and he occupies a portion of the second floor of the new building.

The Nashville manager is J. O. W. Fisher. He recently moved back into his old quarters, upon his forty-second anniversary as an attaché of the Nashville office. He began work with the company in Nashville in 1850, and has been working right there ever since, except during the interruption created by the war. When he first went to work the receipts of the office were for the month $12. Nashville is not, however, an office of large receipts, even in its present state of importance. This is owing to the fact that the main work of the operators is to distribute matter sent here from other points, as explained above. Mr. Fisher has been local manager 20 years and is one of the trusted officers of the company.

INTERIOR OF OPERATING ROOM.



THE OFFICE POLE

Electricity at the World's Fair.

(From Our Own Correspondent.)

The Electrical Building.—Empty and unadorned though the interior of the electricity building is, there is yet a dignity and grandeur about this great receptacle for the visible fruits of electrical genius that impresses the beholder almost as strongly as though the walls were of stone in place of staff, and the vast structure a permanent mercantile mart in place of temporary architecture. But soon the bare outlines will be softened and mellowed by the rich coloring displayed in the harmonious hangings and drapery of the exhibitors, and in the skillful arranging of exhibits in spaces now filled only with the sunshine filtering through the thousand and one diamond-shaped windows. Then the hum of whirling machinery and the voices of the passing multitudes will dispel all silence and infuse life and energy into every corner and section; for the triumphal arch that serves as the grand portal will be the goal toward which all will wend their way in the desire to investigate and study the science that has startled the civilized world with

its wondrous growth. And in keeping with the dominating spirit of the structure, this arch, 60 feet wide and 92 feet in height, more beautiful than the golden entrance to the Transportation Building, "is crowned with a classic pediment containing an escutcheon bearing the electro-magnet as a symbol of electricity, and is supported on each side by a female figure representing the two principal industries connected with this science, electric lighting and the telegraph." High up on the right is the grand medallion of Morse, with Vail on the left; while within the hemicycle are the names of Henry, Morse, Franklin, Page and Davenport, Americans famous for their researches in the science of electricity; beneath will stand the heroic statue of Franklin, the American statesman scientist, and on the main frieze of the niche will be placed the famous epigram of Turgot: "Eripuit cœlo fulmen sceptrumque tyrannis."

It is a grand entrance way, worthy of so progressive an industry, and one that the visitors will linger to inspect the beauties of when the surface is enriched with the colors that artistic skill will apply, and over which incandescent lamps will cast their golden rays.

The sculpture already in position on many of the buildings shows skillful handiwork and vigorous treatment, while a few are so analytical and critical that the expressive features will hold the wandering gaze of many a visitor who will appreciate the perfect portrayal of qualities and characteristics that brought success and honor and fame.

Carl Rohe Smith, of Louisville, is the sculptor of the Electricity Building; John Boyle, of Chicago, of the Transportation Building, and Robert Kraus, of Boston, of the Machinery Building. Surely some of these artists must have been in personal sympathy with the life work and the ideas of some of their subjects, so successfully have they accomplished the task; and when the soft buff color has been applied to the walls, these figures, especially in some of the bas-reliefs, will stand out with color and sharpness of outline characteristic of old ivory. Diana, St. Gaudens' statue now gracing the tower of the Madison Square Garden in New York, and recently illustrated in THE ELECTRICAL WORLD, has been purchased by the exposition officials for $2,500, and will shortly adorn the dome of the Agricultural Building.

The color work on the buildings will be done under the guidance of artists of world-wide fame. John Everett Millais, of the Royal Academy, best known as the leading portrait painter in England; Walter Crane, a famous English designer and decorator, and whose water colors have won many prizes; and Elihu Vedder, a New Yorker by birth, but living in Rome, and whose paintings are valued on both continents, will join hands with F. D. Millet, the well-known American artist, and together they will plan the decoration of interior and exterior, the gilding and coloring of walls and domes, and the selection of banners and flags and pennants, and suggest the location of lamps for decorative purposes.

Transportation Department.—Chief Willard A. Smith has arranged to have three sets of tracks located on the north side of the "stub" system, to be under the joint jurisdiction of the Electrical and the Transportation Departments, and to be used in operating electric and other systems of street car propulsion. The first track will be arranged for the operation of a conduit trolley, the second set for an overhead trolley with a standard potential of 500 volts, and the third track for storage batteries, compressed air and other systems. Chief Smith has received several applications from both foreign and domestic manufacturers of carriages, bicycles and tricycles propelled by electricity, and has secured a special roadway extending in rear of the Annex Building and parallel to Stony Island avenue, on which electric vehicles may be operated at any desired speed. An electrical transfer table is now being completed by the Industrial Works of Bay City, Mich., for the annex to the Transportation Building, and will probably be the largest ever erected. Over the roof of this annex passes the Intramural Elevated Railway, with a station and stairway leading thereto at the southern end of the building, and near by is the terminal station of the Alley Elevated road, which also passes over the Annex. Space is limited in the Transportation Building, as in other departments, and intending exhibitors have been requested to limit the display to only the highest class of productions in their respective lines.

Transportation Facilities.—The Intramural Elevated Railway has secured the location of its power and car houses down in the southeastern corner of the grounds, south of the Forestry Buildings, near the shore of the lake, and in the vicinity of the oil tanks. The power house will be about 150 feet square, and will contain 4,000 h. p. capacity of Babcock & Wilcox boilers, that will supply steam to five direct coupled engines of the following makes: One each McIntosh & Seymour, Williams and Greene, one Reynolds tandem compound of 750 h. p., and one Reynolds cross compound of 2,000 h. p., no belting being employed in the plant. Mr. B. J. Arnold proposes to sink a well in the centre of the house into which the lake water will flow through a tunnel, and then to place incandescent lamps at the bottom of the well to enable spectators to witness the pumping operations. Around the sides of the power house a gallery will extend from which visitors can watch the driving of the machinery. The elevated roadway is now being built by Remington & Co., of Chicago. The cars will be fifty feet in length, with side entrances, a seating capacity of ninety-six passengers, and will be operated three or five to the train.

Work on the steam railway passenger station within the grounds has been started and a monster depot, in which 25,000 people may assemble, will occupy the ground directly west of the Administration Building, and form the architectural companion to the peristyle standing on the opposite side of the Administration Building. The main hall will be 60 × 200 feet and the ceiling 80 feet in height. On the walls 24 clocks will be placed, showing the local time in the leading cities in the world, while two tower clocks with eight dials, six feet in diameter, will show the time of day for some distance away. A dining room arranged for the free use of excursionists bringing dinner baskets is one of the features; and at the entrance to the station two monster locomotives weighing 80 tons each will stand on pedestals 30 feet in height. This depot is intended for excursion traffic only, and all roads will be encouraged to land excursionists here rather than to deliver them within the city, and burden the local lines with their transportation. As mentioned in last week's letter, 24 trains can unload passengers at one time within this station, operating on what is termed the "stub" system. The Wuerple signal system, of St. Louis, will be used on these tracks.

Power.—The foundations for the boilers, engines and dynamos that will furnish the power are in position in Machinery Hall and Annex, and the Standard Oil Company will supply fuel oil at the rate of 70 cents a barrel, which price is to hold good till 1893, when the market price will rule, provided it does not exceed 72½ cents a barrel. Two hundred and fifty thousand barrels will probably be consumed, and with the use of oil a net saving of about 20 per cent. may be effected in the cost of steam, principally in the item of labor for handling the fuel and operating the boilers.

Sunday Closing.—No one thoroughly conversant with the situation believes that the gates will ever be closed on Sunday, as many of the petitioners who influenced the action of the Senate now realize their unconscious labor in the interests of the beer gardens and other resorts of a more questionable character that are elated over the successful fight in their behalf by the Christian people, and are earnestly endeavoring to undo their work. The working people throughout the country have organized a new and comprehensive plan of agitation for open gates on Sunday, and the several thousands who will have to depend on the restaurants within the grounds for their meals on Sunday as well as on the other six days of the week will have their battle fought by the directors. Secretary Dickinson is receiving petitions in every mail and the leading papers throughout the country are fighting in behalf of open gates, realizing that it is not the loss of about $3,000,000 in gate receipts that troubles the directors so much as how to furnish orderly diversion for the thousands who will remain in Chicago over Sunday and who seldom enter a sacred edifice.

Special Exhibits.—The Post Office Department is diligently searching for the first tele graph instrument used by Prof. Morse and his assistants under the appropriations made by Congress in 1845, and a press dispatch states that "It is proposed to exhibit this instrument if it can be found as a part of the display to be made at Chicago by the Post Office Department, for in 1846 the telegraph was a part of the postal service and under its absolute control. A year later, however, despite the protests of Cave Johnson, of Tennessee, at that time Postmaster General, the lease of the telegraph line between Washington and Baltimore passed out of the hands of the government, and was secured by Vail and Rogers, the assistants of Prof. Morse."

In August, 1852, the foreign papers stated that an ingenious mechanic at Brussels "has lately applied a new power to mechanics, from which great results appear to be expected. This new power is galvanism. Across a fly-wheel which is to give motion to the machine he has placed a metallic bar previously magnetized by a galvanic pile, and within the attraction of two very powerful magnets. The moment that the bar arrives in a rotary course at the limit of the attractive power, and whence it would necessarily stand still, the inventor by the application of galvanism suddenly converts the attractive into a repulsive power, which continues the motion in the same direction, and by these alternations the wheel acquires a rapid rotation. The experiment is said to have been successful, and the machine worked for a whole hour." It is expected that this electric motor will be exhibited in the Electrical Department, and being over 40 years old will attract some attention. The inventor's name has not been given.

Foreign Exhibitors.—The State Department has furnished to all foreign countries copies of the special act of Congress relating to patents and reading as follows: "Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that no citizen of any other country shall be held liable for the infringement of any patent granted by the United States, or of any trade mark or label registered in the United States, where the act complained of is or shall be performed in connection with the exhibition of any article or thing at the World's Columbian Exposition at Chicago." Italy will be represented by a full line of the artistic manufactures for which the Italians have always been noted. The Chamber of Commerce of the city of Paris will shortly send a delegation of business men to make full report on the World's Fair, the city of Chicago, the cost of transportation, etc. The French commissioners have directed M. Le Ferve, the superintendent and head gardener for the city of Paris, to personally superintend the horticultural and floricultural work in the French section. Java will have a characteristic Dutch East Indian display, including a village with houses, stores and shops, native musicians and ballet dancers.

Official Changes.—Two important changes occurred this week that may materially strengthen the Fair and hasten the completion of the preliminary work. President W. T. Baker tendered his resignation as head of the board of directors, and H. N. Higginbotham was quickly and unanimously elected in his place. Since Mr. Baker was re-elected last April he has refused to accept any remuneration for his services, and a few weeks ago went abroad for his health, and his letter of resignation was mailed from London. His friends now propose to send him to Congress as the World's Fair candidate from the First District. His successor, Mr. H. N. Higginbotham, is Marshall Field's partner, for thirty years has had a successful commercial career in Chicago, possesses remarkable executive ability, is one of the largest stockholders in the World's Fair, and has been vice-president of the Exposition from the beginning and chairman of the Committee on Ways and Means. Under his guidance World's Fair business will progress rapidly. The second important change was the creation of a Council of Administration, consisting of National Commissioners J. V. St. Clair and George V. Massey, and President Higginbotham and Director Charles H. Schwab of the local board, to whom will be referred all questions arising between Director General Davis and Chief of Construction Burnham, who will hereafter be known as Director of Works. Director General Davis was given exclusive authority to deal with exhibitors and was empowered to make requisition on Chief of Construction Burnham for any assistance which might be needed. Mr. Burnham will have charge of the operating forces on the grounds and make all appointments, subject to the approval of the Council of Administration. Both the director general and director of works are subject to the authority of the council. This council or joint board will remain in constant session at the World's Fair grounds; each of the four will receive a salary of $500 a month; they will appoint a secretary, and eight of the present committees will be abolished. Mr. Ferd Peck was elected first vice-president of the local board to fill the place made vacant by Mr. Higginbotham's promotion. Mr. Schwab has resided in Chicago for 35 years, until two months ago was a member of the wholesale house of Selz, Schwab & Co., was formerly city controller, a leader in organizing the Jewish Manual Training School, and a member of the Iroquois Club. St. Clair and Massey are men of national reputation.

Dedicatory Exercises.—The engraved invitations with accompanying complimentary tickets of admission to the dedication exercises on Oct. 20, 21 and 22 are now being prepared and mailed. On Thursday, Oct. 20, the civic parade will form at 9 A. M. and 70,000 men under command of Gen. Nelson Miles will pass in review before President Harrison, who will occupy the reviewing stand that will project out from the north end of the post office opposite Kinsley's, the column marching west on Adams street and returning east on Jackson. No exercises will occur at the Park until evening when there will be a grand procession along the lagoons of the illuminated floats that are emblematic of the Progress of the Centuries, and also an artistic display of fireworks. It is expected that there will be a grand dedication ball given in the Manufactures Building Thursday evening. On Friday, Oct. 21, all the distinguished guests will be conveyed to the park in carriages under the escort of a regiment of United States cavalry, and the procession of carriages alone will exceed a mile in length. At the Manufactures Building, where 75,000 seats will be arranged, Director-General Davis will assume charge of the exercises. In the evening a second display of fireworks and a further display of floats will occur. Saturday, Oct. 22, will occur the military parade and review at Jackson Park of 50,000 State militia and 3,500 regular troops. It is expected that the Manufactures Building, in which the dedication exercises and the ball will occur, will be ready for interior draping on Oct. 1. The corrugated iron roof is well under way, and the last great truss for the roof was bolted up on Wednesday. This was the completion of the greatest work of its kind ever attempted. The gore trusses will all be in place, the floor cleaned up and the big traveler down by September. Above 13,000,000 pounds, or 6,500 tons, of steel will have been placed in this construction, at a cost of $537,000 It is officially stated that "There are 7,000,000 feet of lumber in the floor, while the lumber in the entire building represents 1,100 acres of average Michigan pine trees, and it required five carloads of nails to fasten the 215 carloads of flooring to the joists. Six games of out-door base ball might be played simultaneously on this floor, and the ball batted from either field would insure the batsman a home run. The Auditorium is the most noted building in Chicago, but 20 such buildings could be placed on this floor. There are 11 acres of skylights and 40 carloads of glass in the roof. The iron and steel structure of this roof would build two Brooklyn bridges, while there is in it 1,400 tons more metal than in the Eads Bridge at St. Louis. There are 22 main trusses in the roof of the central hall, and it required 600 flat cars to bring them from the iron works to Chicago. These trusses are twice the size of the next largest in existence, which are 90 feet high and span 250 feet. The latter are in the Pennsylvania railroad depot at Jersey City.

This building will be provided with 10,000 electric lights. Its aisles will be laid off as streets, and lighted by ornamental lamposts bearing shielded arc lights."

Incandescent Lighting.—The Westinghouse Company has its work well in hand, and Mr. Keller has an army of carpenters and assistants placing the molding on the vulca tubing and the wooden ducts and converter pits in position, so the Grimshaw wires can be quickly drawn in. In the Administration Building, where the lighting effects will be something marvelous, 418 lamps will be placed in the pavilions on the ground floor, 462 in the first story pavilions, 419 in the second and 542 in the third story pavilions, while more than 2,000 additional lamps will be placed at various points under the great domes, on the stairways, in the elevators and the galleries. Then the decorative ribs of the great garden dome, that in size and in beauty is excelled nowhere except by the work of Michael Angelo in Rome, will be enriched by incandescent bulbs, as will also the other principal lines of architecture, such as the main cornice, the high cornice and the main vertical lines, along which lamp bulbs will be placed at regular intervals. As an alternating current will be used in supplying light for the 100,000 Westinghouse lamps, converters must be used, and these are placed in square converter pits, about 5 × 7 feet, and slightly exceeding four feet in depth, the top of which lifts off, affording easy access to all parts. These pit boxes are water tight, are lined with galvanized iron and placed outside of and about three feet distant from the walls of the buildings, and are half buried in the earth. There will be eight converter pits for the Administration Building, each pit holding four 200-light converters, giving a total converter capacity of 6,400 lights. From these pits secondary mains will be carried to eight centres of distribution on each floor in the Administration Building, and the lights are so arranged that each converter can carry its full load independent of the other converters, and only through the loss of every converter assigned to the building would all the lamps prove useless, as each converter controls some of the lamps in each pavilion and on each floor.

The Westinghouse company has also built eight miles of conduit of from two to ten ducts, and is ready to draw in over 18 miles of feeders and mains. Then six miles of duct will be built in the Midway Plaisance. Four 4,000-light alternating current machines are ready, and the finishing touches are being put on a number more at the Westinghouse factory. The Connecticut building has been wired for 107 incandescent lights, and the Massachusetts building for 104 incandescent lights, and a number of others are kept well in hand by the Westinghouse forces.

Souvenirs.—An offer has been received that, if accepted, will result in securing full $5,000,000 for the 5,000,000 souvenir half dollars. For the first souvenir coin Mr. F. S. Terry raised his offer mentioned last week to $1,050, but no account has yet been taken. Excellent offers have also been made for the last coin, and for the 4th coin, the 1492d coin, and the 1892d coin. The remaining coins can be purchased at $1 each, by any one sending a certified check, provided the order is received before the coins are all sold.

Arc Lighting.—In the Horticultural Building an interior court has been planned in which will be placed eight great tanks holding aquatic plants, and over which arc lamps having colored globes will be placed. The 400 arc lamps have not yet been placed in the Transportation Building, as the location of the aisles has not yet been definitely settled, but the circuits are located as the aisles appear on the present plan, and are lettered A, B, C, etc., up to N, while the lamps are marked A 1, B 1, etc., up to 45, according to the circuit the lamp is operated on. Incandescent lamps will be used in the toilet rooms.

An Electric Phaeton.—Degenhardt & Keller are introducing an electrical phaeton that no doubt will be adopted by the World's Fair officials for conveying visitors about the grounds. It will carry two passengers on the main seat while the motorman will occupy the second seat and guide the vehicle. The motive power is a Jenney motor, current to operate which is supplied from six cells of storage battery located under the main seat. Complete it weighs about 400 pounds, runs easily and smoothly, is three feet in width, six and a half feet in length, and will be operated at about three miles an hour. If approved by the fair commissioners, a thousand will be ordered and operated on the fair grounds at the rate of $1 an hour for the service of one vehicle and its operator.

Chief Willard A. Smith, of the transportation department, is advised by cable from Herr Wermuth, Imperial Commissioner for Germany, that the Siemens & Halske Company will exhibit its electric conduit system of railway. A track has been specially reserved for this purpose on the grounds. F. DE L.

CHICAGO, Aug. 20, 1892.

A Submarine Searchlight.

For several weeks a dredging company organized in Gloucester, Mass., has been endeavoring to locate a great quantity of British gold. This gold lies at the bottom of Long Island Sound, under 90 feet of water, just above Hell Gate, near New York City. The amount of money is reported to be not less than $5,000,000, and has been quietly reposing at the bottom of the Sound for more than 100 years. The details of the sinking of the Hussar, a British war-ship, with this large quantity of money and seventy American prisoners of war on board, are very interesting, but would occupy too much of our space to be repeated here. It is sufficient to say that the dredgers have located the sunken vessel over which the tides of 100 years have washed a tremendous quantity of sand and debris, and have already brought to the surface a number of pieces of money, some human bones, pieces of iron, steel and copper, and other fragments of the vessel. The method of searching employed by the diver at the bottom of the sea is shown in the accompanying illustration. A powerful incandescent lamp protected by a double globe and connected by a strong insulated cable to a generator on the wrecker above, furnishes the light for this submarine work. Casting this light before him, the diver prowls around among the rocks and seaweed of the bottom, and explores the remains of the old wreck with al-

A SUBMARINE SEARCHLIGHT.

most as much ease as if he were in the light of day above, and not buried under ninety feet of water. Although previous attempts have been unsuccessful, the present company is determined to prosecute the work, and keep the diver and his light below until his search is rewarded by the glitter of the long-lost treasure.

How Fire Losses Are Prevented in England.

BY G. BINSWANGER,

Managing Director of the General Electric Company, Limited, London and Manchester.

In THE ELECTRICAL WORLD of July 23 I notice an editorial paragraph upon "Fire Risks in Electric Lighting," which interests me greatly.

Your statement that fire insurance companies in America are greatly disturbed by the increased fire losses said to be due to electricity, so much so that they contemplate charging a special premium for buildings in which electricity is used, is one that creates the utmost surprise here. The experience of the British public and that of the insurance companies has apparently been entirely the opposite to that prevailing in America. As an instance, I will cite the Phœnix Fire Insurance office, which, no doubt, covers the greater part of electrical risks. This company has not as yet paid one sixpence for any loss which could be traced to electricity. There is no talk on this side about increasing insurance premiums on account of electric lighting. On the contrary, there is a decided tendency toward reducing premiums where electric light is installed, especially in large buildings. We have here not only the feeling but the conviction that electricity is the safest of all illuminants, of course providing the installation has been efficiently carried out.

This difference of feeling as regards electric lighting in your country as compared with ours is extraordinary, and admits of a number of explanations. One of the main reasons to which the trade ascribes this feeling of security in England is due largely to the Phœnix Fire Office Rules, and to the work done by their inspector, Mr. Musgrave Heaphy, for, undoubtedly, without his or similar exertions and guidance, our electric light installations would not be considered as safe as they are, and, perhaps, we might have been to-day in a similar position to you in America.

You are probably familiar with the Phœnix Fire Office Rules. No doubt you have a number of rules in America which are very elaborate and may appear to you to be better than our rules. You may, therefore, be at a loss to understand how the existence of these rules should make so much difference. The reasons are: First, these rules were compiled at the very commencement of electric lighting, when it was much easier than it now is to oversee every installation and to establish certain standards and instructions. The second reason is, the rules of the Phœnix Fire Office are not like so many other rules, simply "dead letters," but have received direct compliance in every detail through the indefatigable energy and knowledge displayed by their author. It may seem presumptuous to ascribe these great results to the exertions of one man, but any one knowing, as I do, the state of the electric lighting industries in England, and the conflicting interests involved, must acknowledge that I am right in praising what Mr. Heaphy has done for us; and I should think that if you had a man connected with the insurance world in America of his influential position, energy, disinterestedness and enthusiasm for the progress of electric lighting, the paragraph in question would never have been written.

As you may imagine, Mr. Heaphy had in the beginning, and perhaps has now, to encounter great hostility and jealousy not only on the part of many electricians and contractors, but also, and perhaps most of all, from his colleagues in the insurance world.

There is no doubt that if he had given way to such opposition, and if thereby a number of codes of rules had come into force in England, instead of having only one standard code acknowledged to be the best to work by, the effect might have been far different, and possibly we should have had another illustration of the old adage, "too many cooks spoil the broth."

Perhaps, also, the very fact that Mr. Heaphy has from the beginning been the only man we recognize as the authority upon the question of electrical fire risks, and that he has consolidated his position constantly and still holds it, is the secret of his beneficial influence.

I cannot see any reason why electric lighting work should not be brought into the same admirable condition in America as in this country. On the contrary, I think it should be easier, because the conditions seem to be less favorable here than in your country. Our climate is worse as regards the insulation resistance. We are using currents, I believe, of greater pressure than is mostly used in America. We have to deal with smaller manufacturers than you in your country, where the greater part of the industry is controlled by a few large manufacturers or systems.

It would lead me too far to describe in detail my experience with regard to the inspection work of Mr. Heaphy. In my opinion a full description from his pen would be a most useful contribution to the subject, upon which you invite articles from those who have had experience. I will only mention here one practical outcome of such inspection.

I am a manufacturer of electric light supplies for use in houses, such as meters, switches, wires, etc., and for the last 10 years I have made it a rule to submit every improvement and new pattern to Mr. Heaphy before putting it on the market. This has also been the course adopted by almost every large manufacturer in England, and he has most courteously, without further recognition than the knowledge of the benefit he was conferring on the general trade thereby, given us his advice based upon experience in the fire insurance world. Every reader of THE ELECTRICAL WORLD can gauge the importance of this. Owing to this central authority, so to speak, existing here in England, all our fittings have assumed a certain uniformity, any defects arising in course of manufacture being constantly eliminated, so that we have now here a system of electric light fittings which, from the point of view of safety against fire, are excellent, as the results show, for, as I have said, not a single fire in the United Kingdom has occurred since the Phœnix rules were adopted that can be traced to electric lighting.

I am not aware that manufacturers in America have any guidance of this description. To judge from samples of their work that I sometimes see, the contrary would appear to be the case. I have seen a great many electric light fittings coming from America which we would not dare to put into our installations in England, their wires and cables being of an insulation resistance far inferior to our requirements in England. So also with the material used for covering the wires. The regulation in vogue as regards distance to be kept between poles, the workmanship, finish and design of fittings, such as switches, cut-outs, etc., are so poor, from an electrical point of view, according to our notion, that no inspector of central stations or fire officer would allow them to be used in England. The standard carrying capacity here is 500 ampères per square inch sectional area. The types of terminals and the distance between the various terminals, etc., appear to be made in America with a view to cheapness, and not with a view to superiority and quality, as is the case here. The proof that I am right has been the absence for the last nine or ten years of a single fire caused by electricity.

In conclusion, I would say that the necessity of the greatest care and attention to the manufacture of electrical fittings cannot be over-estimated. In my opinion the best way to remove the difficulties of which you speak is to get an authority in America like Mr. Musgrave Heaphy, who has experience in these matters, to organize or establish a certain standard on your side of the water as to the class and type of materials to be used, and the most rigid adherence to such a standard.

Electric Locomotives: Some Results in Actual Working.*

BY ALEXANDER SIEMENS.

The object of the present communication is to place on record the performances of two electric locomotives, the most powerful of their kind, which were supplied at the end of last year by Messrs. Siemens Brothers & Co. to the City & South London Electric Railway.

In the year 1888 the company, then called the City of London & Southwark Subway, issued a specification asking among other things for electric locomotives capable of developing a maximum of 100 brake horse power. Owing to financial considerations, the contract was not placed with Messrs. Siemens Brothers & Co., although a perfect agreement had been arrived at on the technical points of the question.

The City & South London company, however, invited Messrs. Siemens Brothers & Co. again in the beginning of last year to tender for locomotives in accordance with a specification practically identical with that agreed upon in 1888; and as a result two electric locomotives have been built and are now working.

Each locomotive carries two motors and the use of all gearing is obviated by winding the armatures of the motors on the axles of the wheels of the locomotive. This method of construction was illustrated by a model shown at work at a meeting of the Society of Arts on May 18, 1881, and had been first suggested by Sir William Siemens, who, at the time of his lamented death, was actively preparing a proposition to work the Metropolitan Railway by electric locomotives.

The motors for the two locomotives were tested before they were fitted into their places by means of a Prony brake, and some of the results of this first set of tests are given in Table A.

TABLE A.

Speed in miles per hour.	Electrical horse power put into motor armature.	Electrical horse power put into motor magnets.	Total electrical horse power per motor.	Total electrical horse power per locomotive.	Brake horse power, measured.	Efficiency, per cent.
12.25	56 96	2.8	59.76	119.52	110	92
14.77	24.42	1.21	25.63	51.26	47.1	91 87
15.7	21.5	0 86	22.36	44.72	40.2	89.89
17.83	21.85	0.74	22 59	45.18	42.62	94.32
22.73	29.23	0.35	29.58	59.16	54.3	91.79
24.7	19.5	0.2	19.7	39.4	36.6	92.68
30.6	26.27	0.17	26.44	52.88	48.76	92 19

Since the two locomotives have been set to work on the railway they have had to keep the same time as the others, so that their full power cannot be utilized, but it has been found that their efficiency is satisfactory in every respect.

Observations of the current and electromotive force have recently been made simultaneously, by taking sets of readings on the ammeters and voltmeters, both at the generating station and on the locomotive. From these observations the curves accompanying these notes have been plotted. At the time these observations were made the locomotives had run about 8,000 statute miles, and on all four motors the brushes were wearing at the rate of about an eighth of an inch per thousand miles run, this small wear being a consequence of the motors running sparkless and practically without heating.

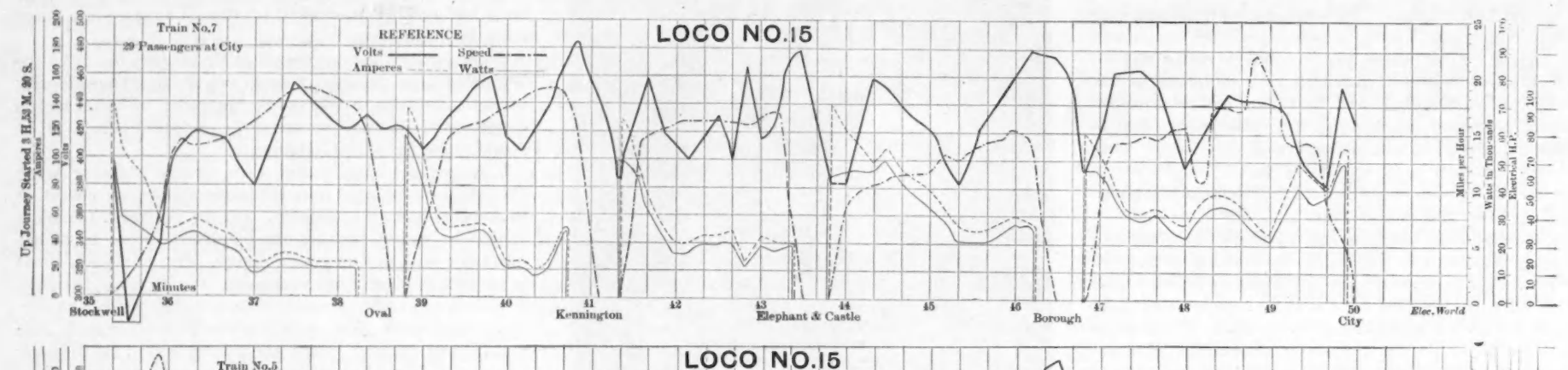
On examining the curves it will be noticed that there is no similarity whatever between those representing the volts at the generating station and on the locomotives respectively; this is, however, easily explained by the consideration that the volts at the generating station are influenced by all the trains in motion at the same time, while the volts on each locomotive are principally influenced by the demand of the locomotive itself.

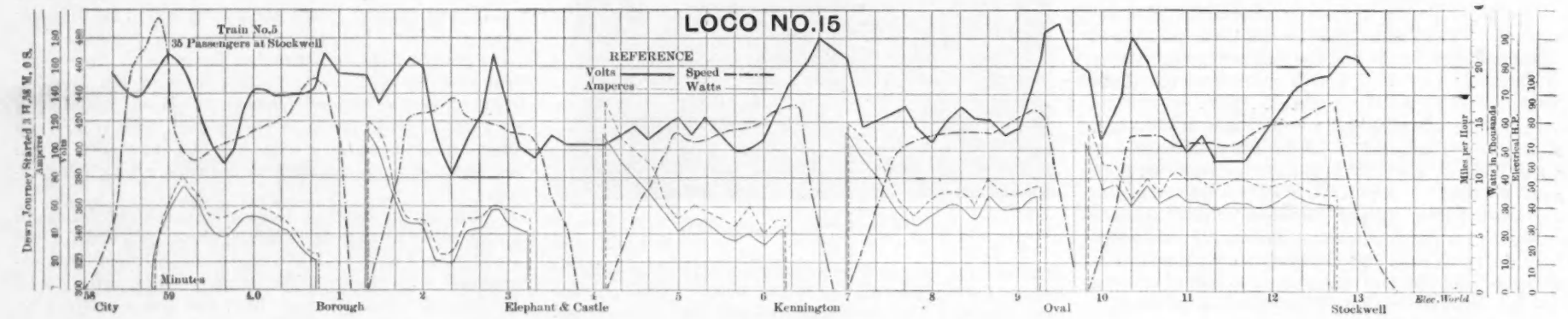
When the train is started the current is regulated by the driver, so as not to exceed a certain amount, by means of switches inserting resistances into the main circuit, but these resistances are cut out within half a minute of starting, so that the waste of energy in the resistances is kept as low as possible.

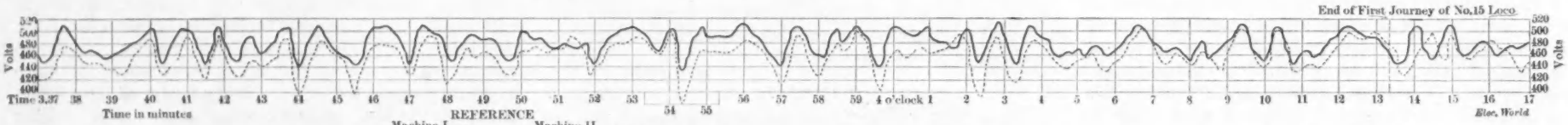
Each locomotive fully equipped weighs 13½ tons, and the weight of the train of carriages it has to draw is about 21 tons. To this the weight of the passengers has to be added.

A summary of the results is given in Table B, which shows that the average power developed by each locomo-

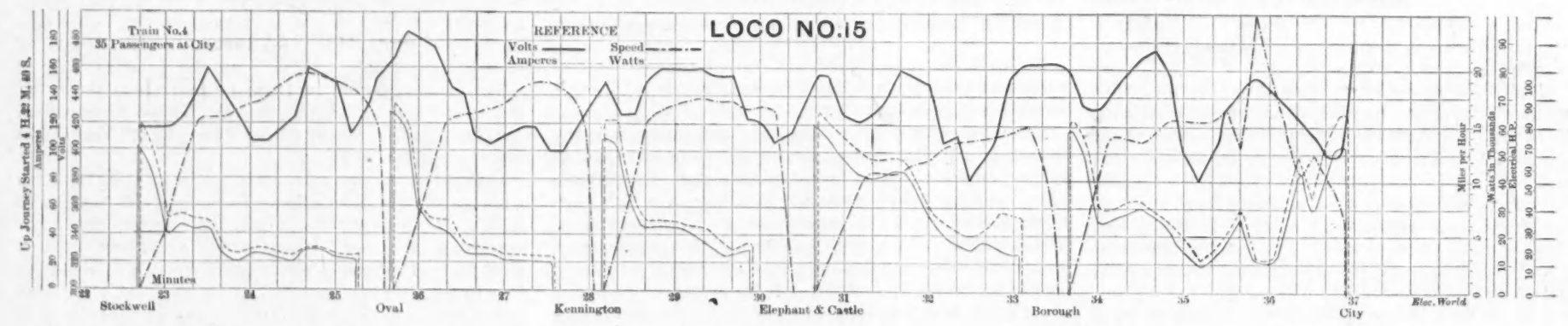
* Read before the British Association at Edinburgh, Aug 5, 1892.

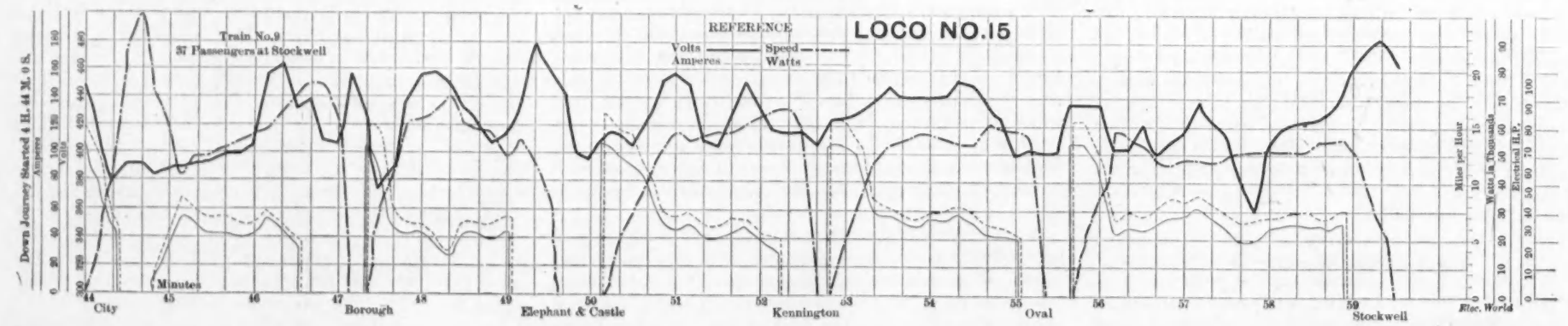


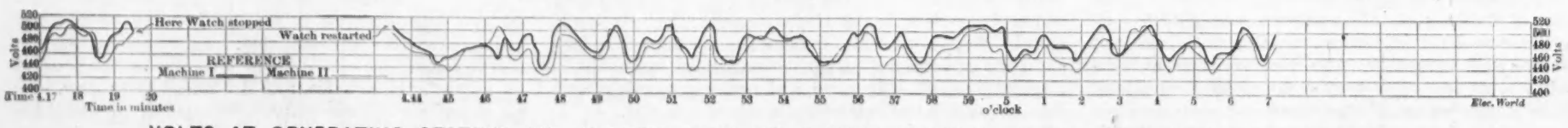




VOLTS AT GENERATING STATION.—NO. 15 LOCO. RUNNING FIRST JOURNEY TO CITY AND BACK TO STOCKWELL.







VOLTS AT GENERATING STATION.—NO. 15 LOCO. RUNNING SECOND JOURNEY TO CITY AND BACK TO STOCKWELL.

tive requires a current of not more than about 50 ampères, although in starting as much as 140 ampères are required.

TABLE B.

	Watt minutes.	Ampère minutes.	Total time including stops.	Mean volts.	Mean ampères.	Average running speed, Miles per hour, exclusive of stops.
Stockwell to City.			M. S.			
Loco. No. 15. Journey 1...	322,660	768.65	14 40	419.7	52.41	13 65
" " Journey 2	291,995	689.53	14 16	423.6	48.34	13.27
Loco. No. 16. Journey 1...	317.640	733.32	14 40	433.2	50.00	13.29
" " Journey 2...	3 5,66)	751.32	14 50	420.15	50.60	13 41
Mean.....	311,988	735.65	14 36	424.16	50.33	13.25

	Watt minutes.	Ampère minutes.	Total time, Including stops.	Mean volts.	Mean ampères.	Average running speed, Miles per hour, exclusive of stops.
City to Stockwell.			M. S.			
Loco. No. 15. Journey 1.....	323,665	766 05	15 30	422.5	49.42	12.19
" " Journey 2.....	312,995	737.98	15 26	424.1	47.83	12.58
Loco. No. 16. Journey 1	305,320	717.99	15 8	425.2	47.46	13.21
" " Journey 2.....	321,660	749.31	14 56	429.25	50.19	12.83
Mean.....	315,910	742.83	15 15	425.26	48.72	12 7
Final mean.....	313,949	739.24	14 55	424.71	49.52	12.97

This fact illustrates at the same time the peculiar difficulties which have to be grappled with in the construction of such locomotives, which have to work under conditions almost diametrically opposite to those of generating dynamos in electric supply central stations.

Experiments on Electrical Resistance.*

BY DAWSON TURNER, M. D.

M. E. Branley has reported in the *Bulletin de la Société Internationale des Electriciens*, May 9,† some experiments on the influence of currents of high potential upon electrical resistance. Some of these experiments have been repeated by the author. It is well known that metallic powders present a very great resistance. This can be lowered to an extraordinary degree by the passage of a spark in the neighborhood. The author has tried among other substances, powdered aluminium, finely divided copper, annealed silenium, iron filings, small shot, mixtures of aluminium and resin fused into a solid stick, etc. The best results were obtained with the first two. A short glass tube is filled with powdered aluminium, and placed by means of copper wires passing through corks in circuit with one or two cells and a galvanometer. The needle of the galvanometer will remain at zero. The resistance of the aluminium is very great. If a spark from an induction coil be passed in the vicinity, the resistance will become at once diminished, and the galvanometer needle will be deflected. Thus, though there was at first no appreciable current, there may now be one of 250 milliampères. The powder will, if undisturbed, remain a conductor for some little time, but if the table be shaken or the glass tube be moved, the initial resistance at once returns and the needle passes back to zero. After the resistance has been once lowered in this way, the powder gets into a much more sensitive condition; a spark at a great distance lowers the resistance and the slightest jar restores it. The author was not successful with ordinary iron filings, perhaps because they were not sufficiently finely divided. More shaking does not restore the resistance of the solid stick of aluminium and resin, but the application of a little warmth does. These experiments would appear to suggest that the molecules become arranged in a definite order under the influence of a discharge, even though the latter occur at a considerable distance.

*Paper read before the British Association, Edinburgh, August, 1892.

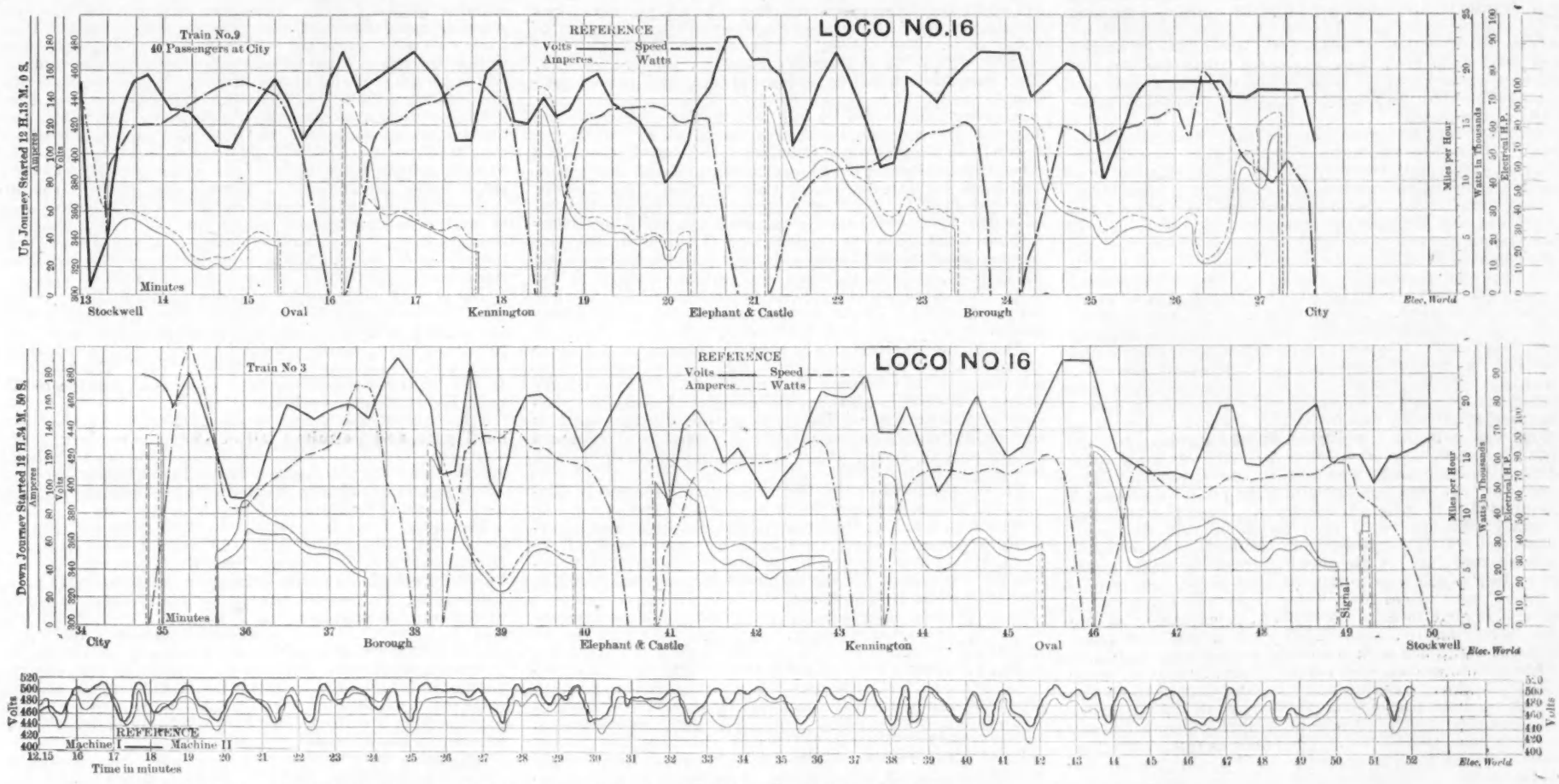
† See also *The Electrician*, London, Vol. XXVII., pp. 221 and 448.

The Destruction of Lightning Protectors by Recent Municipal Legislation.*

BY W. H. PREECE.

The immunity of private houses from being struck by lightning is very marked, and this is considered to be due to the fact that the lead on the roofs and the iron stack pipes that drain these roofs, connected as they are together, form admirable lightning protectors. Any charge of atmospheric electricity which may fall upon a house so protected is conveyed harmlessly away to the earth. Householders are now required to remove these pipes from direct connection with the drains, and to leave an air space between the end of the pipe and the grating of the

* Read before the British Association at Edinburgh.



VOLTS AT GENERATING STATION.—NO. 16 LOCO. RUNNING FIRST JOURNEY TO CITY AND BACK TO STOCKWELL.

VOLTS AT GENERATING STATION.—NO. 16 LOCO. RUNNING SECOND JOURNEY TO CITY AND BACK TO STOCKWELL.

drain. The result is that the electric conduction of the pipe is broken, the stack pipe ceases to be a lightning protector, and houses are left exposed to the dangers of atmospheric electricity.

The remedy is very simple. The pipe need not be entirely cut away; three-fourths of its circular section may be removed for the distance required, and one-fourth may be left to maintain the old electrical connection, or, if the separation has been effected, then the stack pipe should be connected with the drain by a wire or rod so as to restore a path for the charge to the earth.

Householders are also now compelled to put up stack pipes to ventilate their soil pipes, erecting above their roofs a metal tube forming a prominent object, exposed to the atmospheric charge and terminating frequently in an earthenware pipe on the first floor. They are thus liable to be struck by lightning, without offering any means of escape. They should be connected electrically with the earth, either directly or indirectly through the stack pipes, which would then make them sources of safety rather than of danger.

Power Distribution from Central Stations.—II.*

BY PROF. W. CAWTHORNE UNWIN.

I shall indicate later on that in some cases where local conditions are favorable, where there is cheap water power, and the possibility of constructing high-level storage reservoirs, then hydraulic transmission can be adopted with success for distributing power for ordinary manufacturing purposes. But neither telodynamic transmission nor hydraulic transmission has proved suitable as a method for the general distribution of motive power from central stations. Distribution by steam and distribution by heated water have both been tried in the United States, but not with very remarkable success. Only two other methods are available—distribution by compressed air and distribution by electricity.

For many years compressed air has been used to distribute power in tunneling and mining operations to considerable distances. It is only recently that it has been used as a general method of distributing power to many consumers. In many installations the machinery has been rough and unscientific, and the waste of energy very considerable. It is through experience gained and improvements carried out in the remarkable system now at work in Paris, and known as the Popp system, that the great advantages of compressed air distribution have been proved. The Paris system has very gradually developed. About 1870 a small compressing station was erected to actuate public and private clocks by intermittent pulses of air conveyed along pipes chiefly laid in sewers. In 1889 about 8,000 clocks were thus driven. Meanwhile the compressed air had also been applied to drive motors for small industries. The demand for power thus supplied grew so rapidly that a second compressing station was built in the Rue de Saint Fargeau. In 1889 steam air compressors of 2,000 h. p. were at work, and additional compressors were under construction. The pressure at that time was five atmospheres and the largest air mains were 12 inches in diameter. Ingenious and simple rotary machines were used as air motors for small powers, and for larger powers any ordinary steam engine was converted into an air motor. Prof. Kennedy made tests in 1889 which were communicated to this association. He found that a motor four miles from the compressing station indicated 10 h. p. for 20 i. h. p. expended at the compressing station, an efficiency of 50 per cent. only. There were then 225 motors worked from the air mains.

Since 1889 more extended investigations have been made by Prof. Riedler, of Berlin, and the chief part of the waste of work has been traced to inefficiency of the air compressors. Compound air compressors of much higher efficiency have now been constructed. The plant at the Saint Fargeau station has been increased to 4,000 h. p. A new station has been erected on the Quai de la Gare, intended ultimately to contain compressors of 24,000 h. p. Compressors of 10,000 h. p. are already under construction.

Compressed air transmission, whether or not it is the most economical system, is undoubtedly applicable for the distribution of power on a very large scale and to very considerable distances. There is nothing in any of the appliances which is novel or imperfectly understood. The air is used in the consumer's premises in machinery of well-understood types, and old steam engines can be converted into air motors without difficulty and without alteration of existing transmissive machinery in the factories. Not least important, the air can be measured with accuracy enough for practical purposes by simple meters, and charged for in proportion to the power consumed. Air compressors and air motors are not as efficient as dynamos and electric motors, but in one respect distribution by air and electricity are similar. For distances which are not more than a few miles the loss of energy in transmission is small enough to be insignificant.

There is yet one other mode of power distribution which promises to become the most important of all, and which, in the case of transmission to very great distances, if such transmission becomes necessary, has undoubtedly great advantages over every other method.

About electrical distribution of power I shall not venture to say much, partly because I am not an electrical expert, partly because it has been lately pretty fully discussed. In the United States there has been an enormous development of electric tramways, which are essentially cases of electric power distribution. In this country we have the South London and some other railways worked electrically. There are others also on the Continent. But electrical power distribution to private consumers for industrial purposes has not yet made as much progress as might have been expected. Perhaps electrical engineers have been so busy with problems of electric lighting that they have had no time to settle the corresponding problems of power distribution.

No doubt continuous current distribution presents at the moment the fewest difficulties or, at any rate, involves the fewest comparatively untried expedients. Several continuous current plants for distributing power are in operation, of which perhaps the most interesting is that of Oyonaz, which was described in Section G last year by Prof. G. Forbes. There 309 h. p. obtained by turbines is transmitted 8 kilometres at 1,800 volts. It is then let down by motor transformers to a voltage suitable for lighting and driving motors. A number of small work shops are driven, the power being supplied at a fixed rent.

At the Calumet and Hecla mines, on Lake Superior, at the Dalmatia mines, in California, and some other places, energy derived from turbines is transmitted distances of a mile or two by continuous electric currents, and used in driving mining machinery, and some cases of the use of electrical distribution in mines in this country were mentioned by my predecessor in his address last year.

At Bradford a few electric motors are being worked from the electric lighting mains. The largest of these is 20 h. p. The price at which the electricity is supplied is not given, but I believe the cost is high when reckoned for continuous working. It would seem that it must be so when the electric current is generated by steam power.

At Schaffhausen an electric transmission has now been constructed alongside of the wire-rope transmission. The power is derived from two turbines, and is transmitted across the Rhine, a distance of 750 yards, at 624 volts. The current drives a spinning mill, in which the largest motor is 380 h. p. The power is sold, I believe, at £3 per horse power of the motors per annum.

Many engineers have now apparently come to the conclusion that alternating currents will be better for power transmission to considerable distances than continuous currents. One interesting alternate current transmission, partly for power, partly for lighting purposes, has been for some time in operation in Genoa.

On the line of the aqueduct bringing water from the Gorzente rivulet thre electric stations are being established. The reservoirs are 2,050 feet above Genoa, and as this is a much greater fall than is required for water supply purposes, part can be used to generate about 1,600 h. p.

In the first of the power stations erected there are turbines of 450 h. p. driving two dynamos. A second larger station was completed in November. In this there are eight alternate current dynamos of 70 h. p. each. Six alternators are worked in series, transmitting a current of 6,000 volts. The current is transmitted 16 miles by bare copper wires, 8.5 millimetres diameter, placed overhead. The current is used both for lighting and power purposes.

Another method of using alternating currents was adopted in the remarkable experiment at Frankfort last year. In that case energy obtained by turbines at Lauffen was transmitted to Frankfort, a distance of 108 miles, and used for lighting and driving a motor. The current was obtained at low tension, transformed up to a tension of 18,000 to 27,000 volts for transmission, and then transformed down again for distribution. The loss in the conducting wires ranged from 5 h. p., when the turbines worked at 100 h. p., to 25 h. p. when the turbines worked at 200 h. p. The efficiency of dynamo, two transformers, and line ranged from 68 to 75 per cent., a remarkably satisfactory result.

There can be little doubt that if efficient and durable transformers can be constructed, they do give considerable advantage to an alternate current system. To an ordinary engineer it appears also that the system of producing current at low tension in the dynamo, and using it at low tension in the motors, permits the construction of dynamos and motors more mechanically unexceptionable than those working at high voltage.

I have spoken of the growth of a demand for power, distributed in a convenient form in towns. The power distribution in London, Manchester, Birmingham and Liverpool by pressure water, and that by compressed air in Paris, shows how rapidly, when power is available, a demand for it arises. A striking instance may be found in the small town of Geneva.

In 1871, soon after the completion of the earlier system of low pressure water supply, Col. Turrettini applied to the municipal council to place a pressure engine on the town mains for driving the factory of the Society for Manufacturing Physical Instruments. The plan proved so convenient that nine years after, in 1880, there were in Geneva 111 water motors supplied from the low pressure mains, using 34,000,000 cubic feet of water annually, and paying to the municipality nearly £2,000 a year. The cost of the power was not low. It was charged at a rate equivalent to from £36 to £48 per horse power per year of 3,000 working hours. But even the high price did not prevent the use of power so conveniently obtainable.

Since then a high pressure water service has been established, the water being pumped by turbines in the Rhone. From this high pressure service power is supplied more cheaply. On the high pressure system the cost of the power is about 7d. per h. p. hour, or £8 per h. p. for 3,000 working hours.

In 1889 the annual income from water sold for power purposes on the low pressure system was £2,085, and on the high pressure system £4,500. On the high pressure system the receipts in 1889 were increasing at the rate of £880 per year.

In 1889 the motive power distributed, on the high pressure system alone, amounted to 1,500,000 h. p. hours, there being 79 motors of an aggregate working power of 1,279 horses.

In Zurich there is a quite similar system and power, amounting to 9,000,000 h. p. hours in the year, distributed hydraulically to various customers, who pay a rental of £1,200 per annum. It will be noted that all this power in Geneva and Zurich is obtained from water which has been pumped, and it is the low cost of the water power which does the pumping which makes this possible.

But, further, in both Geneva and Zurich the whole of the dynamos supplying electric light are also driven by turbines using pumped water. The convenience of this arises in this way. The fall obtainable in the river in both cases is a small one, and varies. Large turbines are required, and these cannot work at a constant speed. Further, it is expensive to use these large low pressure turbines to drive directly dynamos which only work with a considerable load for a short portion of the day. The low pressure turbines in the river are therefore used to pump water to a high level reservoir, and they work with a constant load all the 24 hours.

From the high level reservoir water is taken as power is required to drive the dynamos, and the turbines driving the dynamos are small high pressure turbines working always on a constant fall at a regular speed and easily adjusted by a governor to a varying load. The system seems a roundabout one, but it is perfectly rational, effective and economical.

Few persons can have seen Niagara Falls without reflecting on the enormous energy which is there continuously expended, and for any useful purpose wasted. The exceptional constancy of the volume of flow, the invariability of the levels, the depth of the plunge over the escarpment, the solid character of the rocks, all mark out Niagara as an ideally perfect water-power station, while, on the other hand, the remarkable facilities of transport, both by steam navigation on the lakes and by four systems of railway, afford commercial advantages of the highest importance. From a catchment basin of 240,000 square miles, an area greater than that of France, a volume of water amounting to 265,000 cubic feet per second descends from Lake Erie to Lake Ontario, a vertical distance of 326 feet, in 37½ miles.

Supposing the whole stream could be utilized, it would supply 7,000,000 h. p. This is more than double the total steam and water power at present employed in manufacturing industry in the United States.

Immediately below the falls the river bends at right angles, and flows through a narrow gorge. The town of Niagara Falls on the American side occupies the table-land in this angle.

The earliest traders who settled near the falls erected stream mills in the upper river in 1725 for preparing timber. Later, the Porter family erected factories on the islands in the rapids above the falls. It was not, however, till about thirty years ago that any systematic attempt was made to utilize part of the water power of the falls. Then a canal was constructed from Port Day, about three-quarters of a mile above the falls, to a forebay or headrace along the cliff overlooking the lower river. In 1874 the Cataract mill was established, taking power from this canal, and other mills were gradually erected, till about 6,000 h. p. was utilized. These mills have been exceedingly prosperous, but since the growth of a feeling against the disfigurement of the falls it has become impossible to extend works of the same kind.

The idea of a method of utilizing the falls, capable of greater development, and free from the objections to the hydraulic canal with mills discharging tail water on the face of the cliff, is due to the late Mr. Thomas Evershed, division engineer of the New York State canals. He proposed to construct head-race canals on unoccupied land some two miles above the falls. From these the water was to fall through vertical turbine pits into tail-race tunnels, converging into a great main tunnel, discharging into the lower river. Apart from an inappreciable diminution of the volume of flow over the falls, this plan avoids any disfigurement of the scenery near the falls, and permits a head of nearly 200 feet to be made available. It is, however, essential to such a plan that work should be undertaken on a very large scale. In 1886 the Niagara Falls Company was incorporated, and obtained options over a considerable area of land, extending from Port Day for two miles along the Niagara River. In 1889 the Cataract Construction Company was formed to mature and carry out the constructional works required.

The present plans contemplate the utilization of 100,000 effective horse power. The principal work of construction is a great tunnel 7,250 feet long, which is to form a tail race to the turbines, starting from land belonging to the company and discharging into the lower river. The tunnel is 19 feet by 21 feet, or 386 square feet in area, inside a brickwork lining 16 inches thick.

The base of the tunnel is 205 feet below the sill of the head gate, and permits a fall of 140 to be rendered available at the turbines. The brickwork of the tunnel is lined for 200 feet from the mouth with cast-iron plates.

The tunnel has been excavated with remarkable rapidity with the aid of drills worked by compressed air.

The main head race, about 200 feet wide, will run for about 5,000 feet parallel with the river, having entrances from the river at both ends. Near the lower reach the Soo Paper Company is already arranging to utilize 6,000 h. p., discharging the water from the turbines through a lateral tunnel into the main tunnel. Near this lower reach will also be placed two principal power stations, from which power will be distributed, either electrically or otherwise, in ways not yet fully determined. The first turbines to be erected in these power stations will be twin turbines of the outward flow type of 5,000 effective horse power. These turbines have a vertical shaft for driving dynamos or other machinery placed above ground.

According to Mr. Evershed's original plans, it was intended to distribute water by surface canals to different power users, each of whom would sink his own turbine pits, connected below by lateral tunnels to the main discharge tunnel. Some of the power at Niagara will undoubtedly be used in this way, and in the case of industries requiring a large amount of power it will be economical to purchase a site and water rights.

Such a plan is, however, not adapted to smaller factories. Obviously for them it would be more economical to develop the power in one or more central stations by turbines of large size under common management. Further, once given the means of distributing power instead of water, an important extension of the project becomes possible.

Besides supplying power to industries which may locate themselves at Niagara, the power may be transmitted to the existing factories in Buffalo and Tonawanda.

Arrangements are already proceeding to transmit 3,000 h. p. to Buffalo, a distance of 18 miles, to work an electric lighting station.

In 1890, Mr. Adams, the President of the Niagara Construction Company, visited Europe to examine the systems of power distribution. It was in consequence of this visit that the important modification of the plans of the company involved in the substitution, to a large extent, of a system of power distribution for system of water distribution came to be adopted. The American engineers were anxious to obtain the best European advice as to the methods best suited to the local conditions. A commission was formed consisting of Lord Kelvin, Dr. Coleman Sellers, Prof. Mascart and Colonel Turrettini, and an invitation was given to engineers and engineering firms in Europe and America to send in competitive projects for the utilization of the power at Niagara and its distribution to different consumers at Niagara and in Buffalo by electrical or other means. Many of the plans sent in were worked out with great care and completeness. As to the hydraulic part of the projects there was some approach to general consent as to the arrangements to be adopted, but as to the methods of distributing the power there was an extraordinary diversity.

Generally the commission reported in favor of electrical distribution, with perhaps a partial use of compressed air as an auxiliary method.

Generally also they reported in favor of methods of distribution by continuous currents in preference to alternating currents. Since the date at which the commission reported, the Frankfort-Lauffen experiment has been made, and in

*Presidential address Section G, British Association, Edinburgh meeting (slightly condensed). For the first section see THE ELECTRICAL WORLD of Aug. 20, 1892.

the opinion of some electrical engineers a distinct advance has been achieved in the use of alternating currents at high potential.

The company has not yet decided to adopt any plan for the central stations except in a tentative way. One or more turbines of 5,000 h. p. are to be erected, and probably at first this power will be distributed to Buffalo by an alternating current system.

The cost of a steam horse-power at Buffalo is reckoned at $35 per annum. I believe the company will be able to deliver power at from $10 for large amounts and a greater price for small amounts, this price being reckoned for 24-hour days.

The new industry of electric lighting has made necessary the provision of large amounts of motive power. Electric traction similarly depends on the supply of motive power. New chemical and metallurgical processes are being introduced which entirely depend for their commercial success on the supply of motive power at a low price.

Niagara is likely to become not only a seat of large manufacturing operations of familiar types, but also the home of important new industries.

The Wasteless Battery Zinc.

Heretofore there has been a great waste of zinc in all the batteries, owing to the fact that the zinc electrode must be removed before it is entirely consumed, the current having become too weak on account of the increased internal resistance due to the decreased size of the zinc electrode, and no practical or economical remedy has been found to entirely avoid said waste, which in the case of the best patterns of

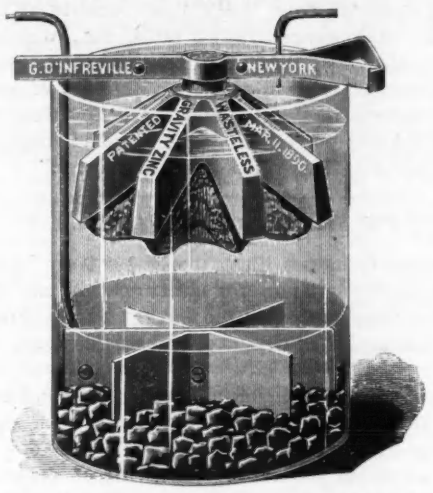
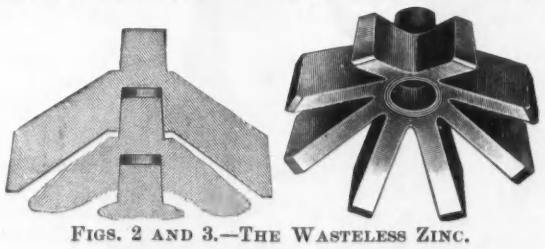


FIG. 1.—D'INFREVILLE CELL COMPLETE.

zinc for gravity battery often reaches 45 per cent. of the total weight of zinc purchased (1½ pounds being wasted out of 3¼ pounds of zinc).

In many places the stumps which constitute the waste cannot be used to any advantage nor sold, for want of a purchaser at that place, and it would not pay to gather them and to ship them to a place where they could be disposed of. In frequent cases, that of telegraph companies, for instance, but about 20 per cent. of the stumps can be gathered with trouble and expense from scattered and distant places, as proved by actual experience. The stumps, even when all collected, can at best be sold as impure metal at but about half the price of spelter.

The object of the "Wasteless" zinc, which is the invention of Mr. Georges d'Infreville, of 434 Canal street, New York City, is mainly to avoid waste of the zinc. This invention consists in using for the zinc electrode a number of pieces adapted to be connected to one another in a column by joints or connections which are liquid tight or adapted to preserve the connecting parts from the action of the battery liquid, so that a partially consumed piece may be connected or attached to the bottom of a fresh or new piece, which latter, after being partially consumed, and



FIGS. 2 AND 3.—THE WASTELESS ZINC.

after the still greater state of consumption of the first one, may, in its turn, be connected under and to a new piece and so on.

This is shown in Fig. 1, which represents one complete gravity element fitted up with the "Wasteless" zinc electrode.

Fig. 2 is a cut of the three pieces constituting said zinc electrode, showing their relative positions, and, as far as can be done by a cut, their comparative sizes, due to the state of corrosion of the two lower pieces, which depends on the length of time they have been in use.

The guarding against corrosion from the solution is also perfectly secure, as the socket below each zinc is in fact an inverted cup, and cannot allow, any more than a diving bell would, the access of liquid against its inside walls.

The conical stud or shank above and the conical socket below each "Wasteless" is a simpler and cheaper method than connecting them by a screw thread, which is, however, also shown in the patent.

This zinc is equally suited to operate circuits of high resistance, such as one single long or a few long telegraph lines, in which case one single "Wasteless" zinc per cell will suffice at first, or to work from the same battery, with two pieces in each battery jar, three times as many similar lines as it was possible to do before with the same size of gravity battery under the same circumstances.

As a new "Wasteless" gravity zinc can at any time be put over or cap another partially consumed one (Figs. 1 and 2), there is no occasion for hesitating as before about the proper time to replace a partially worn out zinc, for fear that doing it too soon would entail too great a waste of metal, or that doing it too late would allow the internal

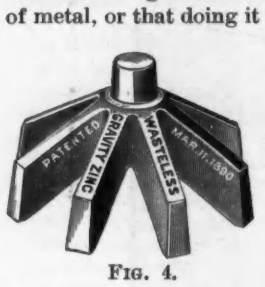
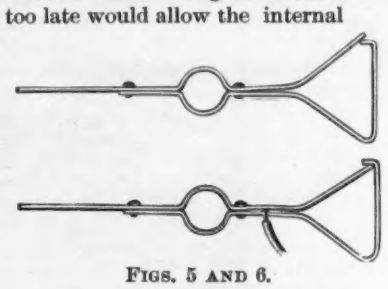


FIG. 4.



FIGS. 5 AND 6.

resistance of the battery to so increase as to fail to produce the necessary amount of current or ampèrage, with all its possible bad consequences.

This is of the utmost value in many cases, as for fire alarm telegraphs, railroad telegraphs and signals, police telegraphs and alarms, and whenever the utmost reliability outweighs any other consideration.

Among the immediate beneficial results derived from the lower internal resistance due to the simultaneous using of two "Wasteless" zincs, one under the other, and one stump under the lower zinc in the same jar (Figs. 1 and 2), is the saving of 50 per cent. in the expense of now superfluous jars and coppers, of 50 per cent. in amount of room required, and of 40 per cent. in total battery weight, and also the resulting savings of money and time in packing, handling, shipping, storing and attendance, with the reduction of risks, delays, etc.

With two "Wasteless" zincs, one under the other, and a stump below them in the same jar (Figs. 1 and 2), the internal resistance falls to 0.7 ohm per cell (the electromotive force being 1.07 volts as usual), giving a current of 1½ ampères; they are, therefore, well suited for operating circuits of moderately low resistance, such as local telegraph circuits, for electroplating and the working of small motors.

The zinc is made at present only for the standard and most generally used glass jar, which measures six inches in diameter at eight inches in height. (Fig. 1.)

The "Wasteless" zinc weighs nearly three pounds, as this weight for several reasons has been deemed to be the most advantageous one for the above named size of jars.

The hanger connector for the "Wasteless" zinc is made simply of two pieces of brass fastened together, has no screw whatever, weighs but about two ounces and takes little room. (Figs. 1 and 5.)

It provides a broad, elastic and tight connection all around the stud of the "Wasteless" zinc which it supports (Fig. 1 On one side it is triangular, so that the whole rests by three points on the rim of the jar, giving sufficient steadiness to the zinc suspended therefrom, while its edgewise position gives it all the rigidity necessarily to safely support at the same time two or more zincs connected in a pile. (Figs. 1 and 2.)

Its triangular end serves also to fasten and securely lock either a wire or a metal strip, not necessarily by their end as when a screw is used, but at any place, from the smaller magnet wire to the largest telegraph office wire.

It renders the connecting and disconnecting easier and quicker than with a screw, an advantage often very important, as in large battery rooms (Figs. 1, 5 and 6).

Pattee's Lamp-Hour Recorder.

Pattee's lamp-hour recorder, shown in the accompanying illustration, which has been quietly introduced into a number of plants during the past year, is now being put on

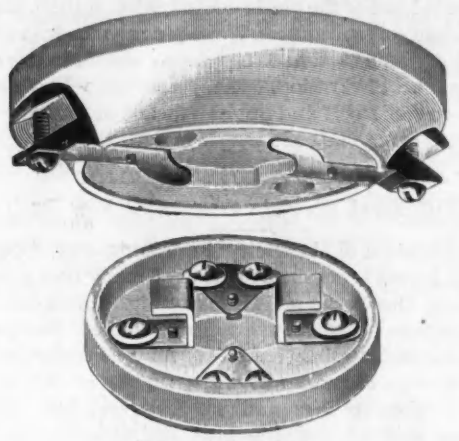
PATTEE LAMP HOUR RECORDER.

the market in an improved form. It is being used with good results on both arc and incandescent circuits, and has been found especially adapted for use with series or series-multiple incandescents.

Many stations will prefer this device to either time circuits or time cut-outs, as it gives the consumer a chance to burn his lamps early on a dark day and late in the evening on special occasions. It can also be used in place of a meter for motors working on a steady load, special windings being used for each case. George Cutter, of Chicago, is the manufacturer.

The Iona Ceiling Cut-Out.

We illustrate herewith a new design of ceiling cut-out, the Iona, which is meeting with marked success. As will be seen from the cut, the cap which holds the fuse is fastened to the base by a long clip interlocking with the piece of the cap; but this is further fastened by a phosphor-bronze spring, making a connection absolutely

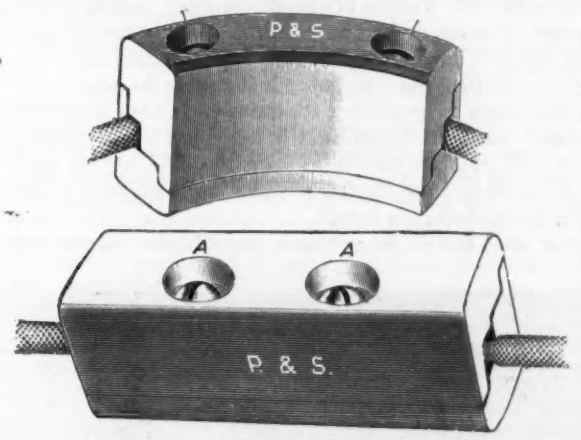


CEILING CUT-OUT.

positive and secure, while obviating the inconvenience of screws. This cut-out is being placed on the market by the Redding Electric Company, 41 Federal st., Boston.

Covered "Bug" Cut-Outs.

In the accompanying illustrations are seen some new cut-outs which have been placed on the market by Pass



FIGS. 1 AND 2.—THE "BUG" CUT-OUT.

& Seymour, Syracuse, N. Y. Fig. 1 shows a fixture cut-out with a cover that can be removed to renew the fuse. It is small enough for the smallest canopy. There are spring connections for both wires and fuse. In case the gas leaks through the insulating joint of fixture it will not be set on fire, as the fuse is thoroughly protected by the cover. The cover is removed by turning the screws back one-half turn. Fig. 2 represents another form of cut-out similar to Fig. 1, but made straight

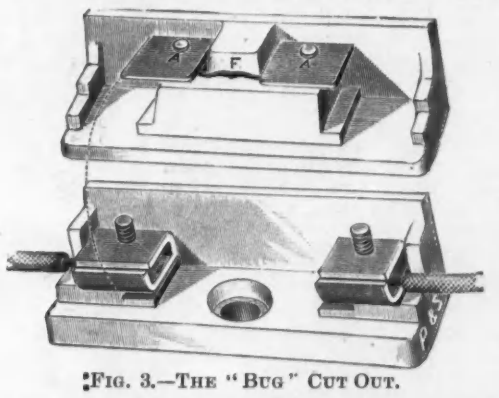
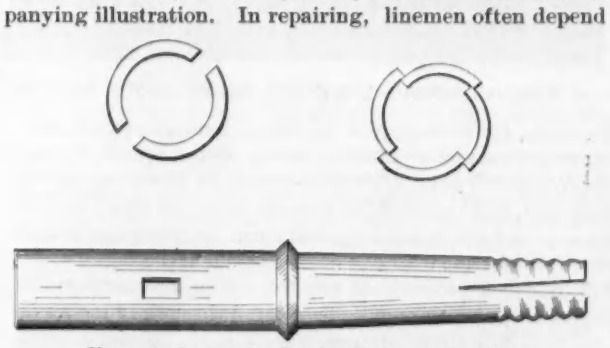


FIG. 3.—THE "BUG" CUT OUT.

instead of curved. It can be used wherever a single pole cut-out is desirable or where wires are run over moldings or cornices. Fig. 3 shows the same with the cover removed.

The Locke Insulator Pin.

A very substantial form of insulator pin, the invention of Mr. F. M. Locke, of Victor, N. Y., is shown in the accompanying illustration. In repairing, linemen often depend



FIGS. 1, 2 AND 3.—LOCKE INSULATOR PIN.

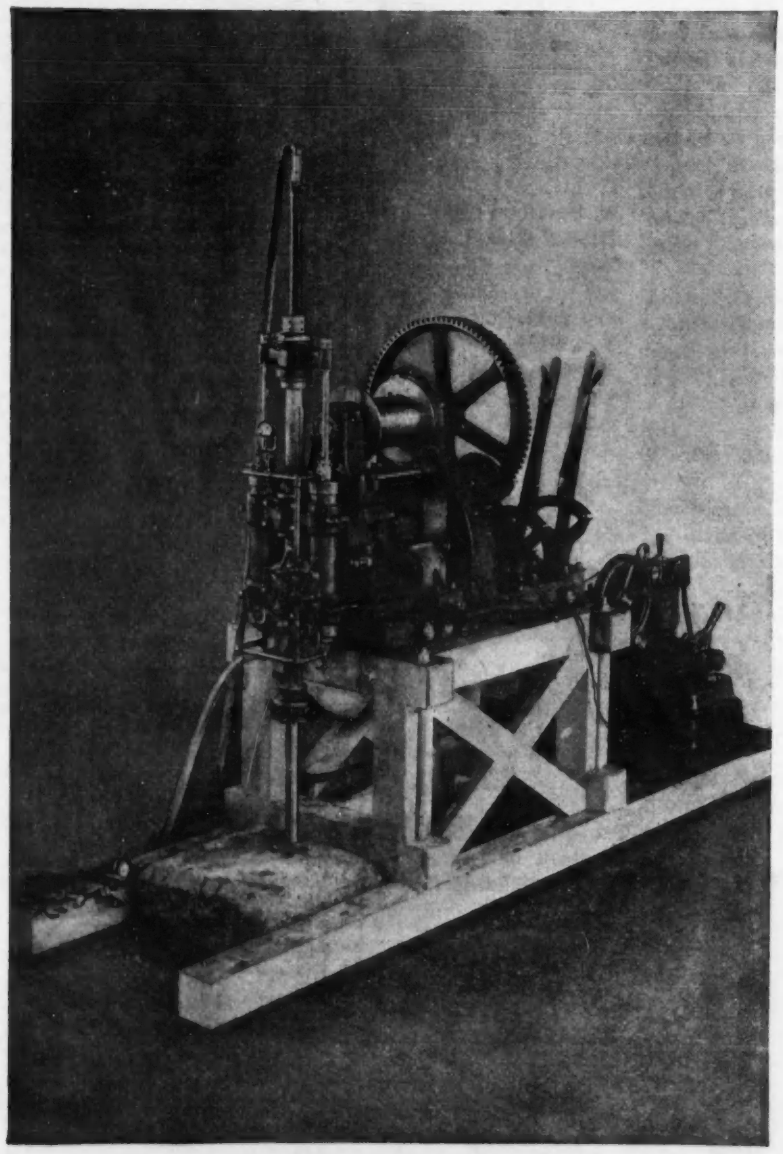
a good deal for support upon the pins in the cross-arms and these often break, endangering the life of the workmen and causing much trouble. The object of this invention is to obtain a pin that will not decay and will be strong enough to support a lineman if necessary. This pin can be made

either solid or of hollow metal, as is seen in the illustration. It has a shoulder which sits upon the face of the cross-arm or support, when in use. The opening at the inner end of the shank is adapted to receive a dowel or nail for the purpose of securing it. The hollow pin, a section of which is also seen to the left of the cut, is preferably provided with a V-shaped slot at the outer end. In order to provide an elastic cushion contact between the pin and the insulator, the threaded end of the pin is coated with a thick layer of lead or some soft substance. These pins are made in several different styles, a section of one being shown in the upper portion of the illustration. They may also be provided with a screw or a bolt and nut as a means of securing them to the cross-arm. They are simple in construction and very durable.

The General Electric Company's New Drill.

The application of electricity in mining operations has caused in recent years the evolution of many new pieces of apparatus. One of the most important of these, the drill, has formed the subject of special attention on the part of electricians and mining engineers for a considerable time past on account of its almost universal use in the mining industry. None of the designs, however, has hitherto fully responded to the demands of the miner. The General Electric Company has just perfected a new diamond drilling machine for which a superiority over any others yet devised is claimed. The drilling apparatus is shown in the illustration mounted upon a heavy timber frame. Behind this is the electric pump supplying water to the drill and having a capacity of about 700 gallons per hour against a pressure of 150 pounds to the square inch. It also supplies water to the hydraulic cylinders of the drill as well as the drill rod. Valves are set in the pipes leading to the pressure cylinder, so that any desired pressure may be put upon the drill bit. A valve also controls the supply of water to the drill rod, the pump being able to supply an ample amount to keep the cutting rim of the bit perfectly free and clean. The drill head is arranged with a heavy hinge so that, when uncoupled from the drill rod, it may be swung away from the frame and allow room for hoisting the drill rods from the hole.

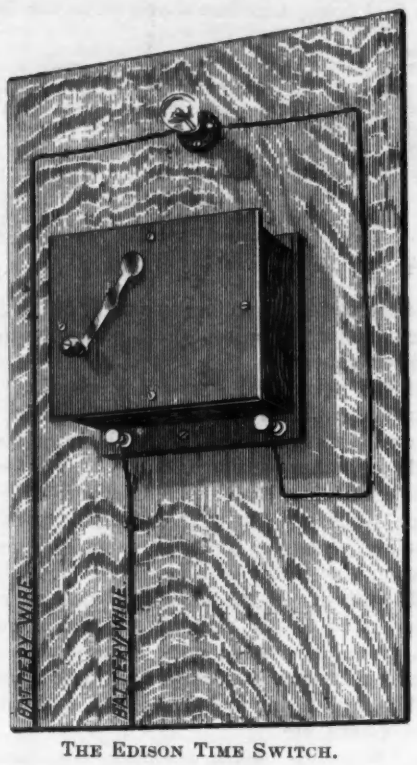
Here, also, the machine shows its complete fitness for this work, for at the top of the main standards of the iron frame is arranged a small hoisting drum, which, by the simple movement of a lever, is geared to the armature of the motor, and the machine is ready, with the aid of a block and fall, to hoist out its own drill rods. In the experiments which were made with one of these drills at the factory, the drill, under a pressure of 120 lbs. per square inch on the pistons of the pressure cylinders, bored through 12 inches of solid granite in three minutes, it is claimed. Under a pressure of 75 lbs. the drill cut through 12 inches in six minutes, and at a pressure of 35 lbs. it cut through the same amount in about 16 minutes. These cutting speeds were made with the drill bit and short barrel coupled directly to the drill head, and will necessarily be slightly diminished when a considerable length of rod has been driven into the rock, but they are sufficiently conclusive to show that the even motion of the electric motor makes it the ideal power for this work.



THE GENERAL LECTRIC COMPANY'S MINING DRILL.

The Edison Time Switch.

This switch, which has just been put on the market by the Edison Manufacturing Company, of 110 East Twenty-third street, New York, is one of the latest electrical novelties. It is a time switch actuated by a clock movement, and is intended to be used in connection with miniature incandescent lamps for cellar or basement lighting, the current being supplied by six Edison Lalande cells, type K. The lamp and battery can be placed in the basement, and the switch at the head of the stairs, so that the lamp can be switched on before descending. There is no chance of the lamp being left burning, as the switch opens the circuit automatically at the end of either 2½, 5, 7½ or 10 minutes, the time depending upon the number of turns given the switch handle.



THE EDISON TIME SWITCH.

The mechanism has a Geneva stop movement, one of the cog wheels carrying a brass contact wheel having an insulated section with a V-shaped groove cut in it. On turning the switch handle and winding up the clock, a contact spring is brought to bear against the metal part of the contact wheel and the circuit is established. When the insulated section has travelled round to the contact spring, the spring locks into the V-shaped groove, the circuit is broken and the clock stops. The switch is connected in series with the lamp, as shown in the cut, and it is possible to operate three or four time switches and lamps in different parts of the house from one battery of six cells, as there would never probably be more than one lamp in use at the same time.

The battery will maintain a 4-c. p. lamp for 100 hours without needing any attention, and estimating that the lamp is used on an average 20 minutes daily, the battery would last about a year. The complete outfit consists of time switch, one 4-c. p. lamp and socket with the necessary wiring and six Edison-Lalande cells, type K, with porcelain jars. It can be seen in actual operation at the office of the company, 110 East Twenty-third street, New York City

Turbine Regulators.

The following communication has been received from the Pelton Water Wheel Company, of San Francisco:

"In THE ELECTRICAL WORLD of July 30, 1892, under the heading of 'Wanted: A Reliable Turbine Regulator,' attention is called to the fact that devices for this purpose have not so far proved satisfactory in running electric machinery. This is unquestionably true as regards turbine wheels or in fact any form of tangential wheels other than the Pelton. While our governing appliances have heretofore met all ordinary demands much more perfectly than any other we know of, it will doubtless be of interest to the profession to know that we now have an automatic regulating device that affords absolute control of the wheel under all varying loads, and that can be depended on for close and sensitive regulation, meeting in the most satisfactory way all the requirements of electrical work.

"Reference may be made in this connection to the large power station of the Roaring Fork Electric Light and Power Co., at Aspen, Colo., where this device has been applied with most satisfactory results under the most exacting conditions of electrical service. The machinery operated from this station consists of pumps, hoists, tramways, concentrating mills, etc., which with constantly changing loads afford as severe a test as is ever met with in connection with this class of machinery. This system of regulation we are applying to several large electric power plants now under construction —the results of which will be furnished later."

The American Giant Dynamo.

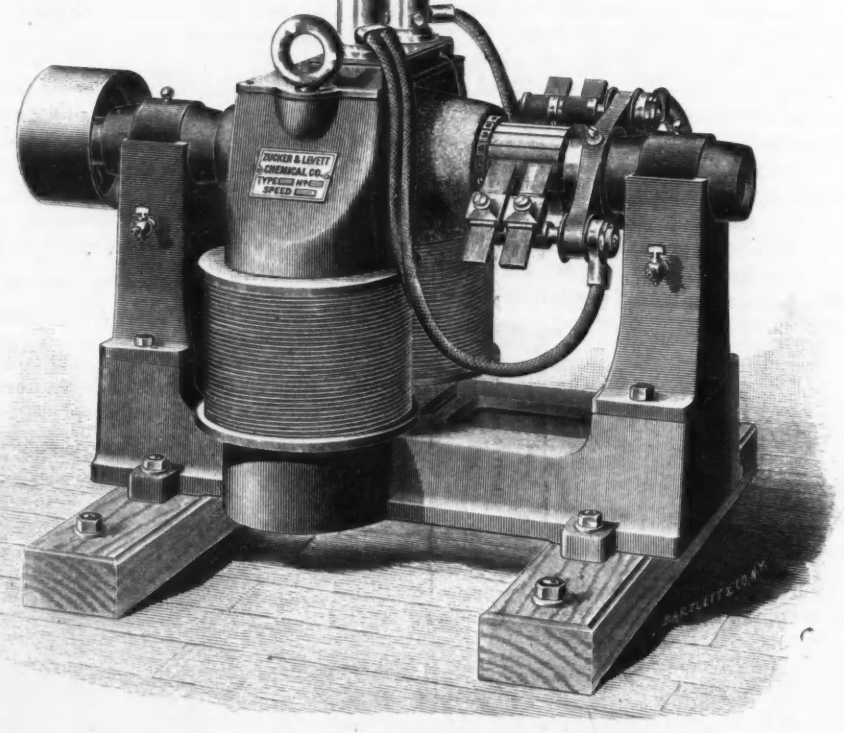
The accompanying cut illustrates the "New Improved American Giant" dynamo, for electroplating and electrotyping, which is placed upon the market by the Zucker & Levett Chemical Co., of this city, and was designed by Mr. Mayer.

The machine is of the inverted horseshoe type, having a laminated field in the smaller sizes and a special cast iron in the larger sizes. There is also a groove on the end of the bearing shell which prevents the throwing of the oil. The field coils are separately wound on brass spools and are interchangeable. The armature, which is of the modified "Siemens" type, is large in diameter, having very few turns, and a large number of sections.

The machine is practically self regulating, that is, the voltage is practically the same whether one or the total number of articles are in the bath; also the power consumed is exactly in proportion to the load, a very important factor if the coal bill is taken into consideration. The efficiency is also very high, varying from 75 to 90 per cent., according to the size of the machine. The machines are shunt wound and reversing is impossible. The mechanical details of the machines are carefully worked out and the workmanship is of the very best. The shafts are short and very large in diameter. The bearings are long in proportion to the diameter and are made of phosphor-bronze.

The brush holders are of an improved pattern and are adjustable in every respect. The brushes can be lifted off the commutator by means of a spring catch.

A large number of these machines have been in use for some time under the most severe tests and they have proved to be most durable and efficient. There is claimed to be absolutely no sparking, excessive heating or wear at the commutator or brushes.



THE AMERICAN GIANT DYNAMO.

Financial Intelligence.

THE ELECTRICAL STOCK MARKET.

NEW YORK AND BOSTON, Aug. 20, 1892.

New York Electric Stock Market.—The principal electric stocks participated in the general industrial movement. General Electric, which will be treated separately on account of its activity and advancing values, drew attention to almost the entire list, and inquiries and a few sales resulted in certain of the securities that have heretofore been very quiet. The general public is just beginning to appreciate the value of these different securities as investment mediums, and with a revival of general activity they will undoubtedly come in for a good share of attention. American Telegraph and Cable was in request in a limited way, selling during the early part of the week at sustained values, and advancing slightly toward the close. American District Telegraph, on limited sales, lost slight grounds, closing a trifle weak at 61 bid and 63½ asked. There is no news concerning this stock except that the company is doing well under the consolidation. Commercial Cable did not receive a sale and was quoted at 157½ bid and 163 asked, as during the two previous weeks. Insiders have the stock completely in hand and it is probable that they will order another advance, when the market makes promise of sustaining it. North America lost a little ground, ranging on limited sales between 13½-13⅝. Officers of the company talk very bullish concerning its prospects, etc., but until the various securities held so largely by it, principally Northern Pacific, show an upward tendency, the public will refuse to avail of tempting offers. There is no doubt but what the company has a good future in its various city railway and lighting enterprises. These it is now just commencing to realize from. It is soon to test, it is stated, the efficiency of its motor for railroad purposes on the Chicago Belt line. If result are successful another and very extensive and profitable field will be opened for revenue.

Boston Electric Stocks.—Each one of the electric stocks in the market has felt the good effects of the present movement in the industrials, and wherever sales have been made nearly every one has shown an advance. General Electric stock is recommended by the best bankers as being as good a purchase at the present figures as when it was ten points lower. Active trading sent the price to 119, but it shows more or less manipulation, since having reached the highest figure it soon reacted over two points. There are no bears on the stock. All speak highly of it and it has become as popular as sugar and other industrial stocks that have been on the market for a longer time. Perhaps more in sympathy with the General stock than from any special news connected with the company, Westinghouse common stock reached its highest point at 34 and the preferred for the first time sold at par, and advanced beyond to 52. There has been very active trading in the stock and it has been bought by strong parties. However, those who got in at the top figures will probably wait a long time before they can get their money back, because there is no evidence of sufficient internal strength to maintain the market at these high figures. Some of the shrewdest buyers in the market formed a pool to buy this stock in large quantities, and, judging from the way it has been treated on the market, it may be that the manipulators are preparing a surprise in it. Friends of the Detroit electric stock continue to try to boom it back to its old figures, but as yet have been unable to raise it beyond 7¼, at which price it has been quite active. The reports on the street have been that the Thomson-Houston company has just issued $500,000 of 5 per cent. debenture bonds, on account of the Manhattan Electric Light Company of New York, but these bonds are three years old and the report of a new issue is, therefore, without foundation. They were issued in 1889 for the benefit of the Manhattan company, who guaranteed to pay the principal and interest, the Thomson-Houston company simply taking such a part in their issue as would facilitate their sale on the market.

General Electric.—This stock surprised even its most sanguine friends this week by its rapid upward strides. The start was made at 115⅜ Monday, being an advance of about 4 points last week, and rapidly mounted to 119. Sales were numerous, and of different natures. There was considerable investment buying, some manipulation and operations by professional traders. At last this latter class have found a stock in the list that is responsive, and they are working it. It is rarely that a security will make so slow, steady and persistent a climb without a reaction, and although we believe that it will go much higher we would not be surprised to see a setback in values within a very short time. The advance in the stock has called attention of investors to the collateral trust 5s. They were very active, $200,000 selling at 104½ to 105¼. They were issued in May to the amount of $4,000,000 to retire the floating debt of the consolidated companies, and were offered to stockholders at 95. They will keep pace with the advance in the stock, as they are convertible into stock at the rate of $100 in stock for $120 in bonds. If the stock goes to 150, as is phophesied by optimists, they will be worth $125.

Westinghouse.—This stock was a feature of the Boston market this week, and reflected its career in the New York market by advancing values rather than activity. It sold in a limited way, closing at 100 against 95½ as the lowest point. Sales of two lots of E. & M. assenting certificates, the first which had appeared in months, were recorded at 60 and 61. The activity in the East is said to be due to the excellent business being done by the company. Much higher values are prophesied.

Edison Electric Illuminating was quiet, selling on Friday at 95½, a loss of two points for the week; $7,000 of its firsts sold at 106¾.

Thomson-Houston Electric Company.—This company has issued $500,000 collateral trust 30-year 5 per cent. gold bonds due in July, 1919. The bonds are secured by $800,000 Manhattan Electric Light Company New York first mortgage 30-year 5 per cent. gold bonds. The Manhattan Electric Light Company has a large and well-equipped station at 80th street and Avenue B in this city and operates an extensive electric system, principally underground, covering the territory from the Battery to Harlem, at remunerative rates. The bonds are redeemable after 1899 at 105 and interest. Marquand & Skehan, of this city, have secured the placing of the bonds. They offer them at 96 and interest.

Western Union.—This stock, as predicted by us last week, has crossed par. The movement was due primarily to reports of good earnings, and probabilities that the dividend would be increased. Buying was heavy and led by S. V. White, who placed himself on record a month ago by saying when the stock was 88 that it would reach par before it touched 85. There was also a demand for collateral trust 5's, sales being made at 104½ to 105, and $14,000 debenture 7's going at 114½-115, against 111½ last week. But operators are now predicting 115 and 120 for the stock. There is a bear side to the situation, as is set forth in the following interview with a very prominent operator of that class: For years Western Union was an active speculative stock and the fight with Baltimore & Ohio sold at very low prices, when the dividends were passed. Then it acquired the B. & O. lines and responded feebly. It has spent as much, or more, every year as it has taken in, but reports a total surplus in round numbers of $15,000,000. Its reports show that this money was all spent on the property and the cash on hand June 30, 1891, was $856,422, out of which a dividend of over $1,000,000 had to be paid in July. The stock is selling at par and its earnings for the stock for the fiscal year ending June 30 were less than in several preceding years. If the company gives a 20 per cent. scrip dividend to stockholders this year holders at present benefit. But on the basis of last year's earnings the company only earned 6.4 per cent. on $100,000,000 capital. Western Union has not sold at par since 1881 and then it sold above it only on the scrip divide.

The Natick & Cochituate (Mass.) Street Railway Company has been in operation about four years, and with the use of horses for motive power was able to accumulate a surplus above the operating expenses and regular six per cent. dividends, sufficient to pay an extra dividendof 50 cents per share. The road is now operated by electricity, taking its motive power from the Natick Electric Light Company. The extra dividend of 50 cents is payable Aug. 16 at the office of the Natick National Bank.

The consolidation of the Lynn and Salem street railways was completed this week. The principal terms of the deal were reported in this column a week ago. President Orne of the Naumkeag road was offered the presidency of the syndicate, but declined it. Hon. A. F. Breed, of Lynn, will be the general manager of the entire system. The roads will be operated as one after Sept. 1, but the corporations will continue separate until Jan. 1. The total mileage is 120, a large percentage of which is operated by electricity,

Copper Market.—The Buffalo strikes caused a temporary hardening in copper values owing to fears that supplies could not be forwarded. This lasted but a day, however, and the situation reverts to 11⅝ cents bid and 11¾ cents asked, with considerable maneuvering on each side. The producers are aware that the fall contracting period is near at hand, and are pledging to stand by 11¾ cents or better; consumers and brokers are trying to break the market, and up to date without success. Exports of 400,000 pounds of fine copper and that much matte were made last week. The principal consumptive demand of the present time comes from the electric supply houses.

Closing Quotations.—The following were the closing quotations of electric stocks on Saturday, Aug. 20, 1892, and the range for the week in New York, Boston and Chicago:

NEW YORK QUOTATIONS.

	Par.	Capital outstanding.	Lowest.	Highest.	Bid.	Ask'd.
American District Tel....	100	3,825,000	62	63	61	63½
American Tel. & Cable..	100	14,000,000	86¼	....	85½	86½
Central & So. Am. Tel....	100	6,000,000	....	....	....	....
Commercial Cables.....	100	7,716,000	....	....	157½	163
Gold Stock & Tel	100	5,000,000	....	....	100	103
Bonds.....	500	500,000	....	....	100	..
Postal Tel. & Cable.....	..	10,000,000	....	....	62	64
Southern & Atlantic Tel..	25	948,775	....	....	78	84
Western Union Tel.....	100	86,199 852	98¾	100⅝	99⅜	99⅝
Real estate bonds.....1,000		1,219,000	....	....	....	....
Debenture bonds. 1,000		4,920,000	114½	115	....	....
Collateral Trust 5's....1,000		8,181,000	104⅝	104¾	....	....
North American.....	100	39.767,200	13½	13⅞	13¼	14
Brush Ill. Co. of N. Y.....	50	1,000,000	....	....	30	60
Edison El. Il. of N. Y.,....	100	6,500,000	95½	97½	96	98¼
" " 1sts.....	...	.....	106¾	....	....	....
Edison El. Il. of Brooklyn.	100	750,000	....	....	85	90
" " " " Chicago..	100	750,000	....	....	130	145
" " " " Boston...	...	.....	....	....	115	125
Edison El. Lt. Europe....1,000		2,000,000	....	....	2	6
" Bonds.....	...	30,000	....	....	65	80
Edison Ore Milling Co....	...	2,000,000	....	....	15	20
East River El Light.....	100	1,000,000	....	....	....	65
General Electric 1,000		50,000,000	115⅝	119	119	119¼
Debenture 5's	...	.....	104½	105¼	....	....
Automatic Exhibition Co.	...	2,500,000	....	....	3	5
Mt. Morris Electric.....	...	500,000	....	....	....	65
N. E. Phonograph.....	..	2,000,000	....	....	2	4
N. Y. Phonograph	...	2,000,000	....	....	2	5
North American Phonograph.....	...	2,000,000	....	....	4	6
Westinghouse Elec. & Mfg. Co. 1st p. 7 per cent. Cum.	50	3,717.253	95	100	....	....
E. & M. Co. Assg.....	50	5.038.116	60	61	....	..

BOSTON QUOTATIONS.

	Par.	Capitalization.	Highest.	Lowest.	Bid.	Ask'd.
Thomson-Houston Elec.—Series C	sh	40,000	....	....	8¾	9
Thomson-Houston Elec.—Series D.....	sh	120,000	8¾	....	8½	8½
Thomson Elec. Weld.. ...	100	1,000,000	....	....	....	45
Thomson European Elec. Weld.....	100	1,500,000	....	....	10	12
Westinghouse Elec.—New Com.	..	6,000,000	30	29¼	32¼	32½
Westinghouse Elec.—Pfd.	..	4,000,000	52	47½	49½	50
General Electric.	..	30,067.200	119	115½	117½	118
" " Pfd ...		4,136,300	120	119	119½	119¾
Fort Wayne Elec.....	25	4,000,000	13⅛	13	12⅞	13
Fort Wayne Elec.—Ser. A.	sh	80,000	8	....	7⅞	8
Detroit Elec.....	10	750,000	7¼	7	7	7⅛
West End St. Ry. Co.—Com	50	7,150.000	74	73¾	73¾	73⅜
West End St. Ry. Co.—Pfd	50	6,400,000	88¼	87	87½	87¾
American Bell Tel	100	15,000,000	204	203½	204	....
Erie Tel. & Tel. Co.....	..	4,800,000	45½	....	....	45¼
Mexican Tel. Co.....	10	1,280,000	1.02½	1.00	1.00	....
New Eng. Tel. & Tel. Co..	..	10,304,600	56½	....	56	56¼
Tropical Tel. Co.....	10	400,000	....	....	....	20c.

CHICAGO QUOTATIONS.

Following are the quotations of telephone and electric stock furnished THE ELECTRICAL WORLD by C. V. Banta, Jr., 167 Dearborn street:

Telephone Stocks:	Bid.	Ask'd.	Electrical Stocks:	Bid.	Ask'd.
Chicago, ex rights...	215¼	..	Chicago Arc Light & Power Co.....	106	106¼
Central Union.....	57½	58	Chicago Edison Co..	172½	..
Iowa Union.....	20	25			
Michigan.....	90	95			
Missouri & Kansas..	56	60			

NEW INCORPORATIONS.

The Maroon Water, Light and Power Company, of Aspen, Colo., capital stock $250,000, has been formed to furnish light, heat, water and power to the citizens of Aspen, Colo. The incorporators are H. P. Cowenhoven, D. R. C. Brown and P. R. Mackin.

The Steelton Light, Heat and Power Company, of Steelton, Pa., has been incorporated with a capital of $40,000 to supply heat, light and power by electricity to the public in the borough of Steelton, Pa. The incorporators are Samuel Couffer, Christian Hess and A. C. Landis.

The Point Marion Electric Light and Power Company, of Point Marion, Pa., has been formed with a capital stock of $10,000, to supply light, heat and power by electricity to the town of Point Marion, Pa. The promotors are W. K. Maple, Chas. A. Conn and Elmer Maple.

Citizens' Electric Light and Power Company, of Newark, N. J., capital stock $1,500,000, has been formed to manufacture, use and sell electrical appliances of every kind. F. Z. Maguire, of New York City, F. A Magowan, of Trenton, N. J., and J. L. Kuser, of Newark, N. J., are the incorporators.

The Kalispell Water and Electric Company, of Kalispell, Mont., capital stock $250,000, has been formed for the purpose of operating electric light and power plants, erecting telephone and telegraph lines, etc. The organizers are Jos. A. Coram, John B. Wellcome, and Frank E. Corbett, all of Butte, Mont.

The Tiburon Point Villa Association, of San Francisco, Cal., capital stock $250,000, has been started to furnish electric power, telegraph and telephone lines, etc. Thomas B. Gardner, P. T. M. Wate, Arthur M. Hill, Edward W. Hill, and Walter K. Freeman, all of San Francisco, Cal., are the promoters.

New York Electric Incandescent Lamp Company, 396 Congress street, Portland, Me., capital stock $2,000,000, has been started to manufacture and sell electrical machinery of all kinds. G. R. Stone, Jas. E. Nounaw, both of New Haven, Conn., and C. Fred Trott, of Waterbury, Conn., are the incorporators.

The California Land and Stock Company, of Seattle, Wash., has been formed with a capital stock of $300,000 to operate water, gas and electric light works, etc. J. Furth, A. B. Stewart, L. S. J. Hunt, of Seattle; W. P. Harrington, of Colusa, Cal.; Luke Ruison, of San Francisco, and J. F. Green are the incorporators.

A Test Suit Over the Control of the Trolley.—The question of supervision over the erection of trolley wires in Brooklyn has been in dispute for some time. The Electrical Subway Commission claimed control, but was not recognized by the railroad companies. It has now been decided to settle the matter by a friendly test suit in the courts.

AFFAIRS OF THE COMPANIES.

The Maywood & Proviso Electric Light and Power Company, of Maywood, Ill., has certified to an increase of capital stock from $20,000 to $30,000.

The Eddy Electric Manufacturing Company, of Windsor, Conn., has voted to increase the capital stock from $100,000 to $225,000 and the number of shares from 4,000 to 9,000.

The Stanley Electric Manufacturing Company, of Pittsfield, Mass., has decided to increase its capital stock to $100,000 and proceed at once to the manufacture of its Stanley alternating current motor.

The Phœnixville Electric Lighting, Power and Street Railway Company is the name of a new organization being formed in Phœnixvills, Pa. Its object is to light the town by electricity, and to furnish power for a street railway. It proposes to erect the power plant at Black Rock dam, or at Valley Forge on the Valley Creek, where there is an ample supply of water power.

Electric Light Companies Combine.—There has been filed with the Secretary of State an agreement for the consolidation of the Thomson-Houston Electric Light and Power Company, of Buffalo, with the Brush Electric Light Company, of Buffalo, forming the Buffalo General Electric Company, with a capital of $1,900,000. The directors of the consolidated company are Daniel O'Day, George Urban, Jr.; William W. Sloan, Thomas Hodgson, John L. Williams, James A. Roberts, Henry W. Burt, Franklin D. Locke, Charles R. Huntley, James Adams, John M. Brinker, Peter P. Miller, of Buffalo, and John I. Beggs, of Chicago.

Special Correspondence.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
167-175 TIMES BUILDING, NEW YORK, Aug. 22, 1892.

Mr. D. S. Van Wagenen, of Brazil, is making his New York headquarters with Doubleday, Mitchell & Co., 136 Liberty street.

Mr. John MacCormick has been appointed sole representative in the East of the Heine Safety Boiler Company, and will have offices at 45 Broadway, New York.

Jas. B. McCreary, 1½ Brown Building, Buffalo, has taken the agenoy of the Security Insulator Company's specialties for Buffalo and vicinity. The Security Company has recently made some very large shipments to Australia.

Protesting Against the Trolley.—The New York Board of Fire Underwriters have passed a resolution against the introduction of the trolley system into the City of New York, and instructing the special committee on electricity to present such protest to the proper authorities.

The Mammoth Glass Works of the E. P. GleasonManufacturing Company, 93-99 Commercial street, Brooklyn, which has been closed since July 1 in accordance with regulations of the glassblowers association, will resume operations on Aug. 24. Since their close they added two new furnaces and made other necessary changes to facilitate the rapid filling of orders. They will employ 600 men.

The Eureka Electric Company, of 18 Broadway, New York, have secured the contract for equipping eleven of the Southern Pacific Railroad Company's steamers with a full incandescent light plant, including a search light for each steamer. Five of the vessels are 400 feet long, six are 350 feet long and will be wired for 350 and 336 lights respectively. The system used will be the Loomis; the Eureka company will also purchase the engines for running the plant.

The Madison Square Garden Tower Electric Search Light, which was fully described in THE ELECTRICAL WORLD of Nov. 21, 1891, has been attracting considerable attention of late. It will be remembered that this powerful search light is driven around a circular railway so as to cast its light in every direction. The motive power is furnished by a Crocker-Wheeler motor, a smaller motor of the same make being employed to feed the carbons.

More Lights for the Statue of Liberty.—Major Heap, of the Engineer Corps of the United States Army, has submitted plans for the better lighting of the Statue of Liberty to the Lighthouse Board. He proposes to place an arc light of 2,000 candle power under the balcony of the torch, with a reflector which will throw the light directly upon the face of the statue. The present lights should, he says, be arranged so as to throw beams of light, and also it is proposed to have two 100-candle incandescent lamps in each of the 25 windows of Liberty's coronet.

Don C. Watters, of Ottawa, Ont., made THE ELECTRICAL WORLD a pleasant call last week. Mr. Watters has now in operation three mines from which his celebrated "Amber" mica is mined. The Lake Girard mine has a capacity of six tons per day, the Horse Shoe mine seven tons per day, and the Nellie & Blanche six tons per day. The Lake Girard mine has a complete steam plant, and the others will be equipped this winter. He has introduced electricity to run the knives for cutting the mica into sizes desired, and employs 25 men and 25 women to do the work. Mr. Watters is now building a storehouse, 90×45, which will enable him to keep in

stock and ready for delivery all sizes that there is a steady demand for. He is also building a large and comfortable boarding house for his employés, and stables for his horses. His "Amber" mica is making new friends every day, and he is now exporting large quantities to Germany and other foreign countries. L. H. H.

ALBANY, Aug. 20, 1892.

The town of Waverly is discussing the problem of lighting the town by electricity.

The motive power of the State Street Railroad of Elmira is being changed from horse to electricity.

Mr. Wm. M. Sturges, electrician of the Albany railway, has tendered his resignation to take effect Sept. 1. It is understood that Mr. Sturges has accepted the position of electrician of the Utica street railway.

The Hudson Electric Railway, which has been leasing its power to run its generator from the Hudson Light and Power Company, has decided to erect a power station of its own. It has not been decided where it will be located.

The new rails on the Troy city road between River and First streets have been laid, completing the line between Troy and Albia. Work on the Troy city power station has been delayed through the failure of the electrical machinery to arrive.

The Johnstown, Gloversville & Kingsboro' Railroad Company reports for the quarter ending July 30 gross earnings $3,759, and net income $1,978. For the corresponding quarter last year the gross earnings were $3,571 and net income $640.

The work of erecting an electric light plant at Green Island will be begun at once. It is the intention to have two 70 h. p. boilers, 100-h. p. high speed engine, a fifty 1,200-c. p. arc light dynamo and an incandescent machine. The plant is contracted to be completed by Sept. 1.

The syndicate which is securing options for the purchase of the stock of the Troy & Lansingburgh railroad company is still making every effort to secure options on two-thirds of the stock. Of the $12,000 of stock the owners of $7,000 have given written agreements to sell, leaving only $1,000 more to be secured.

The cables of the Hudson River Telephone Company have all been laid. The wires have been drawn into the new building and the connections will soon be made with the distributing board. It is not expected that the company will be able to occupy the new building much before Oct. 1.

The State Board of Railroad Commissioners has approved of the increase from $120,000 to $350,000 of the capital stock of the Cayadutta Electric Railway Company whose road runs from Gloversville to Funda. The hearing before the board on the application of the Elmira Transfer Railroad Company for permission to use the electric power on Main street in Elmira has been postponed until Sept. 19. R. V. T.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
Room 28, Hathaway Building, 620 Atlantic Ave.,
BOSTON, Mass., Aug. 20, 1892.

Mr. H. N. Bates, of H. N. Bates & Co., has recovered from his slight attack of illness, and is attending to business as usual.

The projected factory building to be erected by the Washburn & Moen Manufacturing Company at Quinsigamond Village is to be of brick, 256 × 120 feet, two stories.

The Lynn & Boston Railroad makes the fourth street railroad bought by the syndicate. The other three are the Lynn Belt Line, the Naumkeag and the Essex roads. It is not yet known who will be president of the syndicate, though it has been reported that President Amos F. Breed, of the Lynn & Boston, will be chosen. The roads will be operated as one after Sept. 1, but the corporations will continue separate, running under separate presidents until Jan. 1. The total mileage is 120 miles, one-half of which is equipped with electricity.

The Hopedale Electric Company, formed for the purpose of manufacturing cars, electrical apparatus, etc., has decided to locate its works in Milford, and hopes to commence work on the buildings in the near future. The committee in charge at the Milford end has secured options on the Bragg, the Boone, the Draper and the Goodrich properties, fronting the N. Y. & N. E. R. R., beyond the Clapp, Huckins & Temple shoe factory. The only provision made by the management is that Milford donate the site for the works, which will cost probably not far from $6,500 to $7,000. Of this amount Messrs. Draper and Hopedale generously head the list with a subscription of $1,000. W. R. W.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
465 THE ROOKERY, CHICAGO, Aug. 20, 1892.

Lieutenant O. G. Dodge, of the United States Navy, has been assigned to duty at the Columbian Exposition, and is now located at Jackson Park.

Prof. Chas. W. Scribner, of Cornell University, has accepted the chair of Mechanical Engineering at the University of Illinois. Prof Scribner is a graduate of Princeton College and the Stevens Institute, and for four years was professor of Mechanical Engineering at the Iowa State College.

A New Supply House.—Mr. Edward H. Harrison, formerly with H. Ward Leonard & Co., and Mr. P. H. Carey, formerly with the J. C. White Company, of New York, will hereafter engage in the street railway supply business under the firm name of Harrison & Carey, with offices in the Ashland Block, Chicago. Both of these gentlemen are well known to the trade, are popular, and there is little doubt that they will rapidly build up a prosperous business.

A visit to the new Athletic building on Michigan avenue gives an opportunity to thoroughly examine the excellent work which Mr. L. K. Comstock, the electrical engineer, whose office is in the Monadnock Building, has recently done in connection with the wiring of the building, and the use throughout of interior conduit tube. Mr. Mace, the engineer of the Interior Conduit and Insulation Company, on examining it, stated that it was as perfect and complete a piece of work as he had ever seen, and reflects great credit upon Mr. Comstock's able corps of assistants. The conduit for this building was furnished by the Central Electric Company.

F. DE L.

TACOMA, Wash., Aug. 15.

The Northwest General Electric Company has closed a contract for five car equipments, and four miles of electric railroad construction with an electric railroad company in Salem, Ore.

The Point Defiance, Tacoma & Edison Railway Company has inaugurated a fifteen-minute service between North Thirteenth and South Twenty-fifth streets. Supt. N. Lawson has gone to Norway on a vacation tour.

The Union Trunk Line Company, of Seattle, recently struck water at a depth of 670 feet at its James street power station. The well is expected to more than supply the needs of the station when a proper pump is put in operation.

J. P. F. Kuhlmann, the engineer who built the counterbalance line on the Washington street hill for the Rainer Avenue Railway Company, in Seattle, has returned to that city, after building a somewhat similar counterbalance line on Harrison street, in San Francisco, to overcome a 14 per cent. grade for 460 feet.

The Tacoma Light and Water Company will install an arc light plant consisting of three Thomson-Houston 50-light dynamos in the Washington Industrial Exposition building in Tacoma. The Exposition will open Sept. 1. One thousand Edison incandescent lamps and 150 arcs will be used to illuminate the building.

The Portland Gaslight Company's transfer of its property in Portland, Ore., to a syndicate of local and Eastern capitalists has been consummated. Articles of incorporation with a capitalization of $1,000,000 have been filed in the name of the Portland Gas Company, A. L. Mills, C. H. Lewis, Henry Failing and C. A. Dolph.

The Tacoma & Steilacoom Railway Company's affairs have been wound up, and on Aug. 1 everything was formally turned over to the Tacoma Railway and Motor Company, which now owns and operates the line of the former company. Steam motors will not be used to replace electricity as reported by certain papers.

The Washington Electric Company, of Seattle, has sold its stock to its president, Fred S. Sander. The company owned a Thomson-Houston alternating incandescent plant and a valuable franchise. The capacity of the plant will be greatly increased and an arc light machine will be added. Mr. Sander will adopt an aggressive policy and extend his lines all over the city.

The Grant Street Electric Railway, of Seattle, has commenced using power from the Union Trunk Line company's plant, it being nearer to the line than the Seattle Consolidated Street Railway Company's power station, which was the former source of supply. This arrangement is only temporary, as the Grant street line's new power plant will be in operation before long.

G. R. DE V.

CANADIAN NOTES.

OTTAWA, Aug. 20, 1892.

Montreal.—A large number of cars for the Montreal Street Railway Company have been ordered from Cobourg, St. Catherines and Belleville.

Brantford, Ont.—Work has been started on the electric street railway to be constructed in this city, Messrs. Elliot & Phin having secured the contract.

Montreal.—A quarterly dividend of two per cent. on the paid up capital stock of the Royal Electric Company has been declared on the 15th day of this month.

Ottawa, Ont.—The Canadian General Electric Company is applying for supplementary letters patent to enable it to increase its capital stock to two million dollars.

Ottawa, Ont.—The Department of Railways and Canals have under construction a scheme for connecting the several lock stations on the Rideau canal by a telephone system.

Lansdowne, Ont.—The Lansdowne & Rockport Telephone Company has been incorporated at Lansdowne, with a capital stock of $2,500, to build and operate a telephone between the two towns.

Victoria, B. C.—The directors of the Electric Lighting and Tramway Company compute their loss by fire at $80,000. Embers of the fire were still glowing when the president telegraphed east for a new generator to be dispatched without delay. The whole system is expected to be in operation before Sept. 10. The directors met and it was unanimously agreed to rebuild the power house of the best fireproof materials as soon as the insurance is adjusted. Insurance on the burned property was $45,000. Mr. J. Teague, architect, will prepare plans at once for a first class brick, iron and stone building, to be completed in four weeks.

London, Ont.—The proposed London electric street railway offers in return for privileges granted to pay yearly to the city after the construction of the road $100 per mile of single track and $200 per mile of double track, provided the gross receipts of the company exceed $100,000 per annum. They also agree to pay five per cent. upon gross receipts between $50,000 and $100,000, five and one-half per cent. from $100,000 to $125,000, six per cent. from $125,000 to $150,000, six and one-half per cent. from $150,000 to $175,000, seven per cent. from $175,000 to $200,000, and eight per cent. over $200,000.

St. John, N. B.—The contracts for the building of the new power station on Union street for the electric railway have been awarded to Messrs. B. Mooney & Sons for the mason work and W. L. Prince for the carpenter work. It is to be about 35 by 50 feet in size, two stories high, built of brick and after the same design as the present station of the Eastern Electric Company, which it will adjoin. When the new building is joined to the present power station the latter will measure 130 by 50 feet and will be one of the largest and best equipped electric power stations in Canada. A large 200-h. p. boiler is being imported for running the machinery in the new building.

News of the Week.

THE TELEGRAPH.

Past Grand Chief Telegrapher A. D. Thurston, of Vinton, Ia., representing the Order of Railway Telegraphers, has been in Buffalo the past week conferring with Chief MacMahon of the Buffalo division and local members with the Delaware, Lackawanna & Western Railroad. The difficulty is understood to be one of wages.

Telegraph War in Orange.—When the Postal Telegraph Company established an office in Orange, N. J., two years ago it was unable to secure a franchise to construct a line and used the abandoned line of the Western Union from Montclair to West Orange. The Western Union Company has now cut the wires on this line and prohibits the Postal Telegraph Company from using the poles, which has practically paralyzed the business of the latter company.

THE TELEPHONE.

A telephone line is to be built between Middlebourne and Sisterville, O.

The long distance telephone line has been completed between Keene and Nashua.

Pennsylvania Telephone Company.—Following is the annual report of the Pennsylvania Telephone Company as submitted to the department of internal affairs: The capital stock is $750,000. During the year $10,000 was spent in rebuilding lines. The gross receipts of the entire line were $158,813.72. For the construction of new lines $20,943.02 was expended. The total payments for the year were $189,740.74. The surplus fund is $25,143.35. The towns embraced in the system are Harrisburg, Carlisle, Chambersburg, Lancaster, York, Reading, Lebanon, Pottsville, Bethlehem, Allentown, Mauch Chunk, Easton, Hackettstown and Lambertville, N. J.

THE ELECTRIC LIGHT.

Ladoga, Ind., is anxious to have electric lights.

Nunda, N. Y., is to hold a special meeting, Sept. 1, to vote upon the proposition for electric lights. The village is at present lit by kerosene lamps.

The Mt. Union (Ohio) Children's Home is seriously discussing the installation of an electric light plant. Kerosene is the present illuminant.

Luverne, Minn., has finally settled the electric light question and closed a contract with the Western Electric Light Company for an installation to cost $6,500.

The Medina Gas and Electric Light Company, of Medina, N. Y., is inviting bids for proposed enlargements to its electric plant, to include additional arc dynamo, engine, boiler, condenser, etc.

Hickman, Ky., is to have a complete system of water works and an electric light plant of 30 arc and 500 incandescent (alternating) light capacity. The contract has been awarded to J. R. Truesdale, of St. Louis.

Gonic, N. H.—Arrangements are in progress to introduce electricity both for lighting and as a motive power in the woolen mills at Gonic. It is expected that the mills will shut down soon for two weeks in order to place the wires.

The Treasury Department has opened the bids for the furnishing of wire and lamps for the electric light works at the immigrant station, Ellis Island. The Western Electric Company, of New York, was the lowest bidder at $21,350.

Londonville, O., has purchased an electric plant for $15,000. The electrical equipment of Wood arc and Slattery incandescent dynamos was furnished by the Fort Wayne Electrical Company, and the steam plant by the Erie City Iron Works.

Madison, Ind., is to have more light. The gas company, in accordance with its promise to the city, has closed a contract for an arc and incandescent electric light plant. The Fort Wayne-Jenney company secured the contract for a 650-light alternating, incandescent dynamo and the Brush company for a 30-arc light dynamo.

Yuma, Ariz.—H. W. Blaisdell has returned from Boston, where he raised $50,000 for the purpose of putting electric lights and water works into Yuma and Yuma Heights, the new town laid out two miles south of the old town, and to grade and beautify Orange avenue, which will connect the two places. The work will begin at once.

The National Electric Light Company, of Huntington, L. I., has applied to the Town Board for a franchise to light the village by electricity. An exclusive franchise has already been granted to the Standard Electric Light Company, but the National Company's counsel claims that as the company has failed to establish its plant within the time specified by the franchise the board should declare it void.

THE ELECTRIC RAILWAY.

Trinidad, Colo., is to have an electric railway. The project is being worked up by New York and Hartford capitalists.

The Jamaica Electric Railroad Company's plant at Woodhaven, S. I., was not destroyed by lightning, as reported. The only damage done was the burning out of an armature.

The Chicago & St. Louis Electric Railroad.—It is reported that work has commenced on the construction of the Chicago & St. Louis Electric Railroad at Edinburg, Christian county, Ill., and that it will be pushed rapidly forward.

Brooklyn, N. Y.—President Lewis, in behalf of the Brooklyn City Railroad Company, has given the contract to the Babcock & Wilcox Company, of New York, to furnish 20 batteries of boilers, costing over $200,000, for the Eastern District trolley plant. This is the largest contract of the kind ever given out from this city. These will be in place during the winter. The company has also purchased from the Alice Steam Engine Company, of Milwaukee, $300,000 worth of engines.

An Electric Railroad.—An effort is being made to build an electric railroad between Batavia, N. Y., and Oak Orchard Harbor, via Albion, which shall follow the Oak Orchard highway. It is intended both for freight and passenger traffic and it is intended to make it standard gauge, in order that freight may be taken directly from any of the steam roads which the electric line touches. The length of the route is 27 miles. Dwight S. Beckwith, of Albion, and Chas. M. Gibson of Barre, are chiefly interested, and the consents of the property owners are now being obtained.

An Electric Line for Louisville, Ky.—The end of the year may see electric cars running from over the tracks and terminals of the Kentucky & Indiana Bridge Company to the top of the New Albany Knobs, eight miles distant. The cost of making the route an electric line is $80,000. This is an idea that Col. Bennett H. Young and other owners of the Kentucky & Indiana Bridge Company have fostered for some time, and it is now in a fair way to be carried out. The trolley wires are to be stretched so high that they will not interfere with the regular freight and passenger traffic over the bridge and tracks, and in time the highways on either side the bridge may be used for suburban travel, devoting the main track room to railroad travel as now,

The Trolley in Philadelphia.—The Traction Company has let the contracts for the construction and full equipments of the Catharine and Bainbridge streets line, and the work on the road will commence immediately. The line is to be built on the loop belt system, with single track. Iron poles, 28 feet in length and 125 feet apart with the base set in five feet of concrete, will be used. The track will be unusually heavy, 90 lbs. girder rails having been chosen. The power station will be located on Sutherland avenue, near Gray's Ferry road. It is to be equipped with three 250-h. p. Robert Wetherill Corliss engines and three Westinghouse generators. The feed wires will be buried. The cars built by the Brill company will be 25 feet in length and equipped with two single reduction Westinghouse motors.

The West and South Town Street Railway Company, of Chicago, with Congressman McGann as vice-president and general manager, has recorded a mortgage of $500,000 in order to secure an issue of bonds for that amount. This company is allowed five kinds of motive power, and may use three trailers with each motor. The overhead wire privilege is given outright without any other restrictions than that the main electric feeders shall be placed underground. Cable, gas motor, compressed air, and animal power

are also included. This company is considering a proposition to lease all cross-town lines of Chicago and operate them with the overhead wire system, such right having been granted in a section of the ordinance which says that the company may operate over any tracks not owned by it upon making a lease or contract for such purpose with the other company, provided, however, that in such case not exceeding 5 cents fare shall be charged for any distance within the present or future city limits. The company is not limited to a passenger business and will organize a baggage and express department. Arrangement has been completed for the construction and equipment of the road between the Lawndale depot of the Burlington road and the Chicago river, where connection is to be made with the South Side Company's lines. The line on Wentworth avenue is named as a probable extension of the new company.

LEGAL NOTES.

The Williams Patent Vacuum System Sustained.—Five years ago suit was brought against George A. Barnard and the Ingersoll Rock Drill Company for infringement on the Williams Patent Vacuum System of Steam Heating, and a decision has finally been reached in the United States Circuit Court of the Southern District of New York in favor of Warren Webster & Co., 491 North Third street, Philadelphia, who control the patent.

Judge Bischoff, of the Court of Common Pleas, has denied the application of the Thomson-Houston Electric Company for an injunction to restrain the Durant Land Improvement Company from ejecting them from the old Durant sugar house on East Twenty-fifth street. The Thomson-Houston Company refused to pay rent on the ground that the building was not in a safe condition and had not been repaired. This will probably involve the removal of the company, and as it has a contract for lighting part of the Bowery and some other streets in that section, the lighting there may be interrupted for a short time.

MISCELLANEOUS NOTES.

The New England Electric Club has issued a very neat little offical reference book, containing a complete list of members and other information of interest.

Boyer's Speed Diagrams.—In an article on this subject by Mr. Percy Mathews in THE ELECTRICAL WORLD of Aug. 13, 1892, reference was made to a previous article in THE ELECTRICAL WORLD of Dec. 9, 1891. This was a mistake, as the date should have been Dec. 19, 1891.

A Large Isolated Plant.—On Sept. 15 next, when the new Armour packing house is completed and placed in operation, Kansas City will have one of the largest plants in the world using electricity as a motive power. All the machinery will be driven by electric motors, 10 being required with an aggregate of 1,330 h. p.

Storage Battery Litigation in France.—The civil tribunal of Paris, on Aug. 6, rendered a decision in the suits of the Cie Française des Accumulateurs Eléctriques Faure-Sellon-Volckmar against M. Constant Rousseau and M. Paul Gadot. The former was declared to be not an infringer and the latter was directed to pay 5,000 francs damages, interest on the same and the costs of the suit.

The Niagara Falls Power Company expects to be ready to start up by the first of next January. At that time the company will be developing 15,000 h. p. at its tunnel, and by the 1st of April the work in the tunnel will have progressed sufficiently to give them much more. The Niagara Falls Paper Company is erecting a plant to cost $500,000 near the tunnel, and it will be the first company to utilize the great power.

Industrial and Trade Notes.

The Evans Friction Cone Company, Boston, Mass., is doing an extensive business in its line of manufacture.

The Buckeye Electric Co., of Cleveland, O., in view of its greatly increased business has determined to enlarge its output at once.

The Carr Metal Manufacturing Company, of Fall River, Mass., is sending out a very neat catalogue containing a description of its new styles of zincs for battery purposes.

The Mason Regulator Co., of Boston, always unique advertisers, are now sending out a watch case calendar for 1892 and '93, which can be cut down to fit any watch and which is very handy. A two cent stamp will get one.

Mr. A. H. Englund, manager of the International Register Company, Chicago, has been very successful in placing the Pratt Portable Fare Register among the street railways, some 40 different companies now having it in use.

The Electric Construction and Supply Company, of 18 Cortlandt st., New York, has just received an additional order for "Ward" arc lamps for use at the Mechanics' Fair Building, Boston, making a total of 218 now in use there.

The Wilder Duplex Electric Burglar Alarm and Messenger Company has sent out a catalogue which is attractive in form and which contains a very complete description of this excellent system in all its details.

The Redding Electric Company, Boston, Mass., is introducing its new line of electrical goods, which is composed of switches, insulated joints, sockets, cut-outs, etc. It reports that its new switch will be ready for the market in a few days.

The Electric Appliance Company is doing an excellent business in Packard lamps since the extension of its territory and although it is still early in the season for the lamp business, the outlook is certainly encouraging. The sales for the Paranite wire are also increasing daily.

The Hall electric cut-off was recently given a public test in Lowell, Mass. The object of this invention is to cut off the current from any given circuit the moment that circuit becomes broken. At the test a live wire was cut and it fell to the street perfectly "dead." The test was regarded as very satisfactory.

The Electric Engineering and Supply Company, of Syracuse, N. Y., has issued a handsome new catalogue. It is very complete and contains descriptions of electric light and railway supplies for all systems. The numerous illustrations form a very attractive feature and the typographical work is excellent.

Einbigler & Adler, manufacturers and dealers in electrical supplies and contractors for electric work, 430 and 432 Seventh avenue, New York, report having received the following contracts, New Court Square Theatre, Springfield, Mass.; Empire Theatre, Fortieth street and Broadway, New Britain, Conn.; Hyde & Behman's Theatre, Brooklyn, N. Y.

Bowsher's Balancing Ways have recently been added to the machine shop equipments of the Southern Electrical Manufacturing Company, of New Orleans; the Brown & Sharpe Manufacturing Company, Providence; the Ball Electric Company, New York City; the J. H. & D. Lake Company, of Hornellsville, N. Y. and F. B. Fargo, Lake Mills, Wis.

Messrs. Waterhouse Bros., of Hartford, Conn., have just issued a new catalogue which is neat in appearance and artistic in design. It gives a full explanation of their arc lamps and atmospheric clamp latch feed for incandescent and arc circuits, illustrated with explanatory cuts. Every purchaser interested in arc lamps for any circuit should send for a copy.

Messrs. Pepper & Register, the well-known electrical engineers, with offices in the Provident Building, Philadelphia, Pa., have secured the contract to build the Easton, South Eastern & Phillipsburg Electric Railroad, now consolidated and called The Easton Transit Company, work on which will begin not later than Sept. 10, and is to be completed by Thanksgiving day.

The K. A. P. Sockets have been exclusively used at La Crosse, Wis., for the brilliant illumination which is being prepared on Main street. Eighteen arches have been erected, and these, as well as the rods which connect them, are to be decorated with more than 1,500 lights. The K. A. P. Novelty Company is to put up revolving wheel, made up of colored lamps and run by a motor.

Edwin A. Gilbert, the New England agent of the Eddy Electric Manufacturing Company, reports the following sales: A 400-light dynamo to H. H. McKay, Devonshire street, for use in the Old Provincial gold mines in Nova Scotia; a 750-light dynamo to the Holtzer-Cabot Company, for Washington parties; a 30-h. p. motor and a 300-light dynamo for the new Lyceum Theatre, on Washington street, and a 300-ampère generator for the American Lead Company, of Salem, Mass.

The Edison Electric Illuminating Company, of Brooklyn, has decided to build a new plant, and has adopted the plans of the Berlin Iron Bridge Company, of East Berlin, Conn. The building will be 74 feet wide by 100 feet long, with brick walls, the roof being the Berlin company's well known patent anti-condensation corrugated iron construction. The floor space will be controlled by a traveling crane having a capacity of eight tons, which crane will also be furnished by the Berlin company.

The Enterprise Electric Company, 313-315 Dearborn street, Chicago, reports business rapidly on the increase. A branch house has been opened at 15 North Ninth street, St. Louis, Mo., with Mr. W. H. Ferris, formerly with the company at Chicago, as manager. Mr. W. C. McKinloch, of the Enterpise company, is in St. Louis, perfecting arrangements. This company is agent for the National India Rubber Company's wire, manufactured at Bristol, Conn., and reports that it is being very favorably received.

J. D. La Due & Co., electrical contractors, of Marquette, Mich., has secured the contract for a 200-light incandescent lighting plant for the Trout Creek Lumber Company's mills at Trout Creek, Mich. The plant is to be operated by water power. The following extract from a letter from the Trout Creek company is self-explanatory: "We will say in connection herewith, that we are offered a 200 light dynamo and entire plant installed at less figures than yours. We are inclined, however, to the opinion that you will give us better satisfaction."

The Interior Conduit and Insulation Company, 42-44 Broad street, New York, has received a letter from Mr. I. C. Walker, of Walker & Kepler, Philadelphia, Pa., the following extracts from which may be of interest: We have tubed the entire hotel (the New Neversink Mountain Hotel, Reading,) with about 30,000 feet of the brass conduit tube, and have placed the twin wire throughout the entire building. The lightning was said to be the most severe ever seen in Reading, even by the oldest inhabitant of that place, and was seen to play around and through the building in every direction, but did not affect our lines in any manner, not even so much as to blow the smallest fuses.

The Packard Lamp Company, Limited, of Montreal, Can., has completed the equipment of its incandescent lamp factory at 96 to 100 King street, and is now ready for business. The lamps manufactured are the latest improved and well known "Packard High Grade," in all respects similar to those made by the New York & Ohio Company, at Warren, O. The new firm being the only independent lamp manufacturing company in the Dominion making a lamp of an established reputation, and being very advantageously situated as regards the supply of materials and the employment of labor, should be able to command an excellent trade. The complete lamps in all their details, and adapted to any base, voltage and candle power, are manufactured in the King street factory.

The St. Johns Electric Light Company, of St. Johns, Newfoundland, whose station was completely wiped out at the conflagration, have now nearly completed a new brick station on a much larger scale than their old one. This is being equipped by John Starr, Son & Co., Ltd., of Halifax, N. S., with two Leonard Ball compound engines of 100 h. p. each, two 50-light arc dynamos and one 12,000 light alternating incandescent dynamo, made by the Royal Electric Company, Montreal. An incandescent plant of the Lahmeyer system has been installed by Messrs. Starr in the machine shops of James Angel & Co., and they have contracted for another of the same system for the new bakery establishment now being built by Messrs. A. J. Harvey & Co. St. Johns will soon rise from its ashes a finer and more modern city than before.

G. P. Altenberg, the Cincinnati representative of the National Electric Manufacturing Company, of Eau Claire, Wis., has contracted during the yast 17 days for motors aggregating nearly 1,000 h. p. and reports the following sales: A 2,000-light alternating central station to the Bloomington (Ind.) Jenney Electric Light Company; a direct current incandescent plant to the Crescent Cotton Oil Company, Memphis, Tenn.; a 60-arc light plant to a Cleveland, O., syndicate; an arc light outfit to the Bristol (Tenn.) Gas and Electric Light Company; a 50-light arc plant to the Covington (Ky.) Electric Light Company, and a complete equipment to the Bucyrus Steam Shovel and Dredge Company, of Bucyrus, O., now removing to South Milwaukee. This last company will depend exclusively on electric motors for its power. An Allis Corliss engine, belted to two 200-h. p. slow speed National generators, will operate 11 national stationary motors and the electric cranes, besides furnishing current for 25 arc and 125 incandescent lamps.

Business Notices.

Battery Cut-Out, Cheap.—Sensitive, reliable, never requires attention. Gas lighting much improved by its use. Electric Supply Company, of 105 South Warren street, Syracuse, N. Y.

Recommended To All Interested in Electrical Science.—Mr. Wm. G. Murphy, Jr., of Marysville, Cal., states that he is well pleased with "Houston's Dictionary of Electrical Words, Terms and Phrases." It is just what one needs always near him. I cheerfully recommend it to all who are delving in the science of electricity.

Lamp Factory for Sale.—An incandescent lamp plant of modern construction now running with a capacity of 600 lamps a day can be purchased outright, or an interest in same secured at a reasonable price. A rare chance for a good investment is here offered. Address, HIGH EFFICIENCY,
465 "The Rookery," Chicago.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

In Charge of W. A. Rosenbaum, 177 Times Bldg., N. Y.]

U. S. PATENTS ISSUED AUGUST 16, 1892.

480,721. Electric Arc Lamp; F. D'A. Goold, of New York, N. Y., assignor to the Edison General Electric Company, of same place. Application filed Dec. 5, 1891. The invention consists in an improved tilting mechanism for forming the arc and feeding the carbon.

480,722. Snap Switch; F. D'A. Goold, of Schenectady, Assignor to the Edison General Electric Co., of New York, N. Y. Application filed March 26, 1892. In this switch the switch arm remains stationary in both its open and closed positions until the spring suddenly operates to throw it.

480,727. Armature Conductor and Means for Insulating the Same; E. Kolben, of Schenectady, Assignor to the Edison General Electric Co., of New York, N. Y. Application filed Feb. 8, 1892. According to this invention the conductors forming the convolutions of the coil are separated by two strips or sheets of insulating material in such manner that no breaks in the continuity of the insulating material occur directly across the metallic face of the conductor.

480,728. Ring Armature; E. Kolben, of Schenectady, Assignor to the Edison General Electric Co., of New York, N. Y. Application filed February 8, 1892. An armature having the conductor comprising its coil bare on two opposite sides of the armature, whereby either side may be employed as a commutator surface.

480,729. Electric Drop Annunciator; T. W. Lane, of Boston, Mass., Assignor to the Electric Gas Lighting Co., of Portland, Me. Application filed December 19, 1891. A combination of a magnet, spring, guides, rods, armatures, standard, pointer-rod, lever-arm, and lifting device.

480,739. Commutator for Electro-Magnetic Machines; H. F. Parshall, of Schenectady, Assignor to the Edison General Electric Company, of New York, N. Y. Application filed Dec. 11, 1891. The combination, with the segments of a commutator cylinder, of conductors for connecting them in pairs, each of said conductors having two bent sections in different planes, a section connecting the same, and bent ends or extensions connected to the segments.

480,740. Armature for Dynamo-Electric Machines; H. F. Parshall, of Schenectady, Assignor to the Edison General Electric Company, of New York, N. Y. Application filed Dec. 11, 1891. A toothed or grooved armature core with one or more perforated sections interposed between grooved sections, said perforations coming in line with the grooves. (See illustrations.)

480,745. Electric Light Fixture; J. T. Robb, of Mount Vernon, Assignor to the Edison General Electric Company, of New York, N. Y. Application filed Aug. 31, 1891. The combination of a block or cover carrying terminals on one side, a pipe inclosing or adapted to inclose conductors and adapted to support an electric device, brackets fixed to the opposite side of said block or cover, and a gimbal-joint between said brackets and pipe.

480,749. Standard; L. T. Stanley, of Brooklyn, N. Y. Application filed May 15, 1891. In combination, a base, a rod or tube of flexible metal, secured to said base, so as to be adapted to have a revoluble movement in said base, a spiral spring surrounding said rod or tube and connected to said rod or tube, and a socket connected to the upper end of said spring. (See illustrations.)

480,762. Ventilated Brush for Dynamos; H. H. Cherry and D. Younglove, of Syracuse, N. Y. Application filed Oct. 2, 1891. The brush is built up of wire gauze.

480,766. Guide for Replacing Electric Trolleys; G. Fortin, of Florisant, Missouri. Application filed April 11, 1892. In combination with a trolley pole and trolley secured in the end of same, the herein described replacing device pivotally secured to the trolley-pole, consisting in a bifurcated lever arm, the lower depending member of which is closed and provided with means of attachment for a rope to operate the same, and the upwardly extending member of which is inclined outwardly, forming a V-shaped opening between the same at right angles to the line of the trolley wire.

480,780. Commutator for Ring Armatures; G. Pfannkuche, of Cleveland, O., Assignor to the Brush Electric Co., of same place. Application filed July 8, 1890. The commutator is provided with air passages which terminate at the periphery or contact surface of the commutator in contracted openings so that the air forced through said openings will issue in the form of jets.

480,782. Electric Lighting System; M. J. Quirk and C. Bach, Jr., of Milwaukee, Wis. Application filed Oct. 29, 1891. In an electric lighting system, the combination of a switch lever swinging laterally upon a pivot at right angles thereto, a switch pole arranged to one side of the lever and adapted to engage said lever when the same is swung laterally there against, a stop arranged upon the opposite side of the lever, a spring plate engaging the switchpole, push buttons, one of which is adapted to engage directly the end of the lever to throw it laterally into contact with the switch pole and the other constructed to engage the spring plate to release the lever from said switch pole, and electric lights within the circuit.

480,787. Injector or Insufflator for the Larynx, etc.; W. Scott, of Leavenworth, Kan. Application filed March 14, 1892. An injector for the throat, larynx, etc., comprising a casing for surrounding the injector tube, a hollow battery holding handle, having its top secured to the under side of the injector tube casing, and a projection of the top of the casing extending downwardly, forward and laterally.

480,794. Arc Welding and Heating Apparatus; P. I. Unwin, and H. Howard, of Halesowen, near Birmingham, England, Assignors to Lloyd & Lloyd, of the same place. Application filed June 14, 1892. In heating and welding by the electric arc, the combination of a continuous current dynamo, mains connected to the two poles of the dynamo, an accumulator or secondary battery having its poles connected to the mains in parallel with the dynamo, two or more conductors, each having one end connected to one main and the other end to a pencil, two or more conductors each having one end connected to the other main and the other end to the work or support of the work, and two or more resistances, each interposed between one of the mains and the pencil or works.

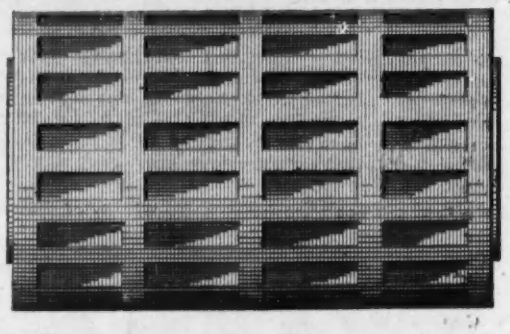
480,802. Electric Fuse; O. T. Blathy, of Buda-Pesth, Austria, Hungary. Application filed May 8, 1890. The combination with the fusible wire of a safety fuse, of one or more movable discs threading the wire, the openings in said discs being approximately of the size of the wire.

480,804. Electric Dispatch System; A. Bryson, Jr., of New York, N. Y. Application filed Oct. 15, 1891. The object of the invention is to provide a carrier for dispatch systems, having its own electrically propelled motor and adapted to have its direction controlled from the start, whereby it will automatically be switched off and the circuit broken or changed, as the case may be, to a predetermined station or branch.

480,813. Combined Gas and Electric Light Fixtures; A. T. Enos, of New York, N. Y. Application filed Oct. 31, 1891. The combination with two gas pipes pivoted together, of semi-cylindrical pipes having their open sides resting against the gas pipes, forming conduits carrying an electric conductor, and a joint exterior to the gas pipe joint and between the gas pipes connecting with said semi-cylindrical pipe through which the continuous wires of the conductors pass.

480,845. Electric Elevator; F. E. Herdman, of Indianapolis, Ind. Application filed Oct. 26, 1891. The invention has for one of its objects to regulate the speed of the elevator proportionate to the load, so that as the load increases over a normal the speed will decrease and the work of the motor remain constant.

480,846. Electric Elevator; F. E. Herdman, of Indianapolis, Ind. Application filed Dec. 22, 1891. In an electric elevator, in combination, an electric switch, solenoids, a core common to both magnets connection between said switch and the core, electric connection between one pole and the source of current supply and each of the electromagnets a lever carried by the car, electric connection between the other pole of the electric current supply and the lever, contact points carried by said car, said lever being adapted to be brought in contact with either contact point, and electric connection between said contact points and the electromagnets respectively. (See illustration.)



No. 480,741.—ARMATURE FOR DYNAMO-ELECTRIC MACHINES.

480,850. Electric Railway; R. M. Hunter, of Philadelphia, Pa., Assignor by mesne assignments to the Thomson-Houston Electric Company, of Boston, Mass. Application filed May 28, 1887. The combination of a working conductor arranged parallel to the railway, a supply conductor, a magnetically actuated switch, to connect or disconnect said supply and working conductor, a traveling vehicle, a motor to propel said vehicle receiving electricity from said working conductor, and a magnet carried by said vehicle, having its north and south poles brought together in close proximity to the magnetically actuated switch.

480,880. Storage Battery; E. P. Usher, of Grafton, Mass. Assignor to the Hopedale Electric Company, of West Virginia. Application filed Aug. 22, 1891. In a storage battery, flanged plates or frames combined with active material in tablet form and with interposed separators. (See illustration.)

480,884. Battery Cell; E. P. Usher, of Grafton, Mass., Assignor to the Hopedale Electric Company, of West Virginia. Application filed Feb. 19, 1892. The invention consists of an outer wall or receptacle, a lining of acid-proof gum applied thereto, and a thin shell imbedded in said gum lining and coating externally and internally therewith, the parts being permanently united by the hardening of the gum.

480,885. Storage Battery; E. P. Usher, of Grafton, Mass. Assignor to the Hopedale Electric Company, of West Virginia. Application filed Feb. 19, 1892. A battery cell composed of alternate positive and negative plates and interposed separator-plates, in combination with sealing-strips applied to the vertical edges of the several plates along the lower portion thereof.

480,886. Battery Plate; E. P. Usher, of Grafton, and W. F. Draper, of Hopedale, Mass., Assignors to the Hopedale Electric Company of West Virginia. Application filed Feb. 19, 1892. A unit of active material for battery plates, consisting of a tablet of lead oxide or its equivalent formed of a wrapper of lead-foil and a filling of dry powder, with a conducting strip imbedded therein, and protruding therefrom.

480,887. Battery Plate; E. P. Usher, of Grafton, Mass., Assignor to the Hopedale Electric Company, of West Virginia. Application filed Feb. 18, 1892. A battery plate consisting of a marginal frame with open interior spaces and one or more cross-bars, a perforated lead foil wrapper as distinguished from ordinary sheet lead adhering to said frame and bars, and a filling of active material within said spaces and inclosed by said perforated foil, the edges of said plate being sealed by an acid-proof gum.

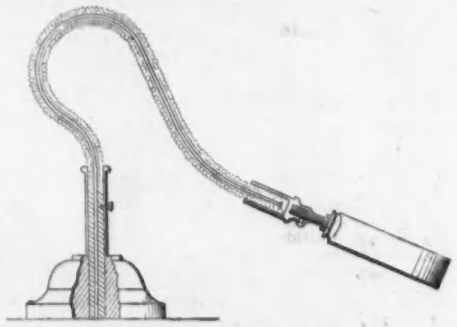
480,888. Electrical Measuring Instrument; E. Weston, of Newark, N. J. Application filed March 11, 1891. In an electric instrument a movable index-arm, and a body of diamagnetic material, in plate or disc form disposed transversely the lines of a field of force connected to and operating to retard or oppose the oscillatory motion of said index.

480,889. Apparatus for Retarding or Dampening the Motion of Moving Bodies in Electrical Instruments; E. Weston, of Newark, N. J. Application filed March 11, 1891. In an electric-indicating instrument, two conductors, in coil or loop form, mechanically connected and bodily movable in an axial direction in a field of force, one of said conductors being in electric circuit and the other short-circuited or closed on itself.

480,890. Electric Time Indicating Apparatus; E. Weston, of Newark, N. J. Application filed March 11, 1891. A means of producing a field of force a loop-conductor vibrating therein on the passage of a current, and a device actuated by said conductor for showing the number of its vibrations.

480,891. Temperature Regulating Device for Electric Circuits; E. Weston, of Newark, N. J. Application filed June 4, 1891. In an electric measuring instrument, a coil, a means of indicating variations in the temperature of said coil and in circuit with said coil, a variable resistance and an electrical conductor, the resistance of which decreases with augmented temperature.

480,892. Rheostat; E. Weston, of Newark, N. J. Application filed Dec. 5, 1891. In an electrical instrument and in circuit, a body of high resisting material, an elastic or resilient support therefor, an abutment and a screw operating to force said body of high resisting material against said abutment and in opposition to the elasticity or resiliency of said support.



No. 480,749.—STANDARD.

480,893. Rheostat; E. Weston, of Newark, N. J. Application filed Dec. 10, 1891. The combination of two series of contact plates disposed substantially on the circumference of a circle and opposite to one another, resistances interposed between said contact plates, and pivoted contact-arms relatively insulated from and disposed diametrically opposite one another.

480,894. Electrical Measuring Instrument; E. Weston, of Newark, N. J. Application filed Jan. 8, 1892. In an electrical measuring instrument, a vibrating or rotating coil, an index or pointer actuated by said coil to move over said scale, and a means of opposing a gradually decreasing mechanical resistance to the forward movement of said index.

480,895. Electrical Measuring Instrument; E. Weston, of Newark, N. J. Application filed Jan. 14, 1892. A flexible body of conducting material extending between abutments and in electrical main circuit, a means of applying strain at an angle to said body at a point therein between said abutments, and an index or pointer and scale, the said index being controlled by the displacement of said point, due to said strain when said body is traversed by an electric current, in combination with a shunt between the terminals of said main circuit.

480,896. Electrical Measuring Instrument; E. Weston, of Newark, N. J. Application filed Jan. 14, 1892. A flexible body of conducting material extending between abutments, a means of applying strain at an angle to said body to a point the con between said abutments, and an indicating device showing the displacement of said point due to said strain when the distance between said abutments is varied.

480,897. Electric Measuring Instrument; E. Weston, of Newark, N. J. Application filed Jan. 14, 1892. In an electric measuring instrument, a flexible, expansible body in open loop form extending between abutments, one of said abutments being fixed and the other adjustable, and two or more flexible and practically frictionless supports sustaining said body, the said supports permitting of the longitudinal movement of said body due to variations in the length thereof. (See illustration.)

480,898. Electrical Measuring Instrument; E. Weston, of Newark, N. J. Application filed Feb. 17, 1892. In an electric measuring instrument, an inclosing case having a portion of one of its walls detachable and a scale upon said portion.

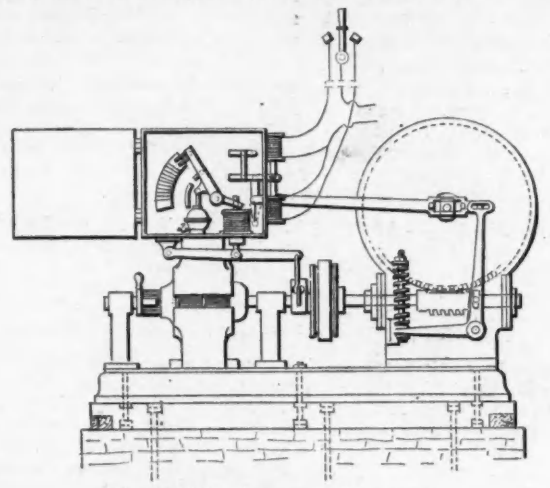
480,899. Electrical Measuring Instrument; E. Weston, of Newark, N. J. Application filed Feb. 19, 1892. In an electrical measuring instrument, a magnet having concentric poles, the inner pole being substantially tubular or ring-shaped or the outer pole curved around the periphery of the inner pole, and a movable coil extending through said inner pole and through the space between said poles.

480,900. Adapter or Plug for Incandescent Lamp Circuits; E. Weston, of Newark, N. J. Application filed March 22, 1892. An adapter constructed detachably to engage with the fixed or stationary portion of an electric lamp socket and provided with two circuit-conductors having their inner extremities disposed to make electrical connection with the circuit terminals in said stationary socket, in combination with a plug or holding device also provided with circuit terminals and constructed to engage detachably with said adapter so that the terminals in said holding device shall make electrical contact with the conductors in said adapter.

480,915. Rosette for Electric Lighting; E. W. Buffington, of Fall River, Mass., Assignor of one-half to A. F. Dow, of same place. Application filed May 27, 1891. The wires are attached to the rosette by means of spring clamps.

480,918. Electric Locomotive; R. Eickemeyer, of Yonkers, N. Y., Assignor to the Eickemeyer Field Company of New York. Application filed Dec. 21, 1889. In an electric locomotive or car, the combination of a truck frame, a motor suspended from said truck frame between the axles a counter-shaft driven by the electrical motor and geared to one of a pair of car axles and a gear frame which is varied wholly by a gear and braced against rotation thereon by means of a brace extending to and connected with the second axle.

480,947. Electrical Pressure Indicator; J. W. Howell, of Newark, N. J., Assignor to the Edison General Electric Company, of New York, N. Y. Application filed Jan. 2, 1892. An indicator having a resistance sensitive to changes of current and having another such resistance not in use, but reserved as a test resistance, a switch constructed to throw either one of these resistances in circuit and at the same time to change the galvanometer contact from one point of connection to another.



No. 480,846.—ELECTRIC ELEVATOR.

480,948. Swap Switch; J. Hutchinson, of New York, N. Y., Assignor to the Edison General Company, of same place. Application filed Jan. 12, 1891. The combination in a circuit making and breaking switch, of a circular track for a switch arm, having a series of double inclines, and contact plates in the alternate depressions formed by said inclines one end of each of said contact plates being in the form of a spring.

480,951. Incandescent Electric Lamp; G. F. Mellick, of Metuchen, N. J., Assignor to the Edison General Electric Company, of New York, N. Y. Application filed March 4, 1892. An incandescent lamp having several filaments connected in series, and a short-circuiting switch mounted on a metal sleeve on the base of the lamp.

480,968. Electric Arc Lamp; R. Shefbaur, of Paterson, N. J., Assignor to the Edison General Electric Company, of New York, N. Y. Application filed Nov. 24, 1891. The invention consists in an improved electric arc lamp constructed with a differential solenoid containing a suction core into which the carbon carrier extends, which suction core has an extension for checking the downward movement of the upper carbon holder, said extension also serving to move the upper carbon holder upward by means of a suitable gearing.

480,988. Adapter for Incandescent Lamp Sockets; H. P. Ball, of Schenectady, Assignor to the Edison General Electric Company of New York. Application filed May 7, 1892. An adapter for sockets, consisting of a sleeve suitable to receive the base of a lamp or other electrical device, the sleeve having an inwardly extending flange or part at its base, an insulating or insulated disc in said end of the sleeve and having a central screw-threaded hole.

481,019. Incandescent Electric Lamp and Lamp Socket; B. Ford, of Gloucester, N. J. Application filed Nov. 27, 1891. An incandescent lamp having its base provided with two terminals, one of which projects downward is adapted to extend within the socket piece, is recessed upon its end, and contains a high-resistance fusible or destructible substance.

481,025. Joint for Electric Wires; W. E. Harrington, of Atlantic City, N. J., Assignor of one-half to L. Atwood, of Philadelphia, Pa. Application filed Aug. 28, 1891. A joint for wires, consisting of a sleeve having a longitudinal passage and a transverse opening communicating therewith, wires in the longitudinal passage, the ends of the wires being bent in the transverse opening, and a filling of cast material imbedding the ends of the wires.

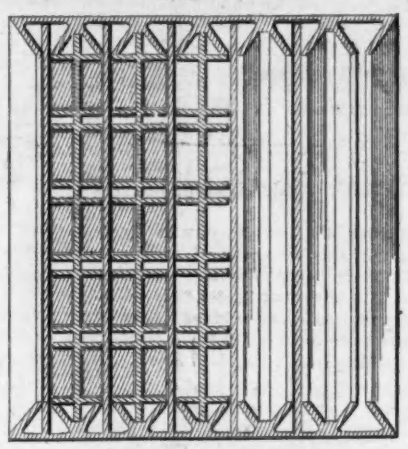
481,030. Method of Electric Welding; H. Howard, of Halesowen, near Birmingham, England. Application filed May 31, 1892. In heating and welding with the electric arc, the combination of a main connected to one pole of the source of electricity, two or more pencils connected to the said main, two or more resistances, each interposed between one of the pencils and the said main, and a second main connected at one end to the work to be heated or welded, and at the other end to the other pole of the source of electricity.

481,042. Electric Train Signal; G. Merritt, of San Francisco, Cal. Application filed April 13, 1892. In an electric train signal, the circuit wires thereof extending throughout the train, in combination with a metallic rod passing through the car, and forming part of the circuit, a contact-piece also led into the circuit, and a pivoted lever electrically connected with the metallic rod and adapted to be moved into and out of electric connection with said contact-piece to close and open the circuit.

481,067. Incandescent Electric Lamp; E. McOuat, of Boston, Mass. Application filed June 9, 1891. The method of making an incandescent electric lamp, consisting of the following steps: first, uniting to the interior of an adhesively hot glass tube two platinum wires; second, causing the said tube to collapse by heat, so that the edges of the tube shall seam together and form a globular mass around the wires; third, drawing the wires away from each other and outwardly, dragging the adhering glass with them, so as to insure better contact, and to leave the glass in better form for resisting fracture.

481,048. Microphone; E. Noriega, of Mexico, Mexico. Application filed June 11, 1891. A carbon for microphones, formed of charcoal, boric acid and water.

481,049. Telephone; E. Noriega, of Mexico, Mexico. Application filed June 11, 1891. In a telephone receiver, a pole-piece formed of a series of round rods or wires of different diameters attached to the pole of a permanent magnet and forming an oblong core adapted to receive the bobbins.



No. 480,883.—STORAGE BATTERY.

481,050. Microphone; E. Noriega, of Mexico, Mexico. Application filed May 7, 1892. In a microphone the combination of a vibratory carbon plate, a fixed carbon plate, and a mass of carbon filaments placed between the fixed and vibratory carbon plates.

481,051. Microphone; E. Noriega, of Mexico, Mexico. Application filed May 7, 1892. The invention consists of a diaphragm of wood or analogous material, with the edges bound with elastic rubber binding, perforated carbon blocks secured to the diaphragm, carbon cylinders inserted in the perforation of the blocks, a pressure-spring for holding the cylinders against the sides of the apertures in the blocks and a body of fibrous absorbent material interposed between the spring and the carbon cylinders.

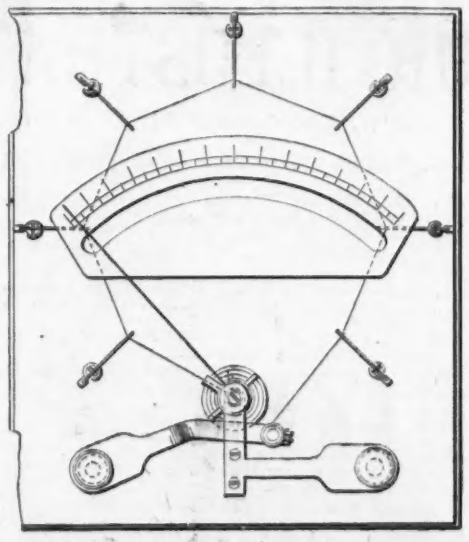
481,062. Electric Control of Railway Trains; R. C. Sayre, of Bristol, Eng. Application filed March 10, 1892. The invention consists, essentially, in leading the power to the motors driving the train through a valve, an electric switch, or other means to suit the power, which is so held against the resistance of a spring or weight by means of a current passing to the train from conductors laid parallel to the permanent way that the power can pass freely to the said motors, and in interrupting the current to the train at desired places and under desired circumstances, so that the valve or switch is automatically operated to shut off the power from the said motors and must be again replaced by the driver or guard and held by the magnet before power is again admitted to the train.

481,075. Electric Battery; P. Stiens, of Charlottenburg, Germany. Application filed April 2, 1892. The combination of one or more tiers of battery cells, a supply tank located above the battery cells, a receiving tank located below the battery cells, a force pump and its complement connections for emptying the contents of the receiving tank into the supply tank, a feed pipe communicating with the supply tank and with the upper tier of cells, air pipes communicating with all the cells of the respective tiers and serving as overflow pipes, connecting tubes between the respective tiers of cells and the receiving tank, counterbalanced arms normally closing said connecting tubes, and regulated vessels supported by said counterbalanced arms at a higher level than the respective tiers of jars with which they are in communication.

481,114. Combined Telegraph Key and Circuit Closer; W. F. Lott, of Philadelphia, Pa., Assignor of one-half to Romuald T. McDonnel, of same place. Application filed April 26, 1892. It is the object of the invention to provide an improved appliance consisting of a combined telegraph key and circuit closer, in the employment of which, as a key, in the ordinary way the switch is automatically opened by the initial stroke of the instrument in transmitting the message and is automatically closed after the message is sent upon the removal of the finger of the operator.

481,120. Electric Annunciator; F. A. Pickernell, of Newark, N. J., Assignor to the American Telephone and Telegraph Company, of New York. Application filed April 16, 1892. A self-setting annunciator, having an electromagnet organized when excited to release the single drop or shutter and an auxiliary electromagnet organized to reset or restore the said shutter by shortening or reducing the resistance of a magnet circuit, including the core and armature of said electromagnet.

481,132. Insulator; W. J. Bowen, of Norwalk, O., Assignor to W. Hubbard, of Elgin, Ill. Application filed May 2, 1892. The combination of a hollow spherical shell divided through the middle, having screw-threads on each half for attaching them together, the top half provided with means for fastening the same to any support, an insulating material within the shell, having embedded within it a headed pin, passing through the same and provided at its outer end with an eye, to which the conductor is connected and supported.



No. 480,897.—ELECTRICAL MEASURING INSTRUMENT.

481,133. Mechanical Telephone; W. J. Bowen, of Norwalk, Ohio, Assignor to W. Hubbard, of Elgin, Ill. Application filed May 2, 1892. Adjusting devices for regulating the tone are accessible from the outside of the instrument.

481,138. Telephone; F. H. Brown, of Chicago, Ill., Assignor of one-half to Sidney F. Andrews. Application filed March 23, 1891. In an apparatus for transmitting articulate sounds telephonically, the combination of a permanent magnet, one pole of which is movable in close proximity to the other pole, a diaphragm, and a connection between the diaphragm and the movable pole of the magnet.

Copies of the specifications and drawings complete of any patent mentioned in this record—or of any other patent issued since 1886—can be had for 25 cents. Give date and number of patent desired and address The W. J. Johnston Co., Ltd., Times Building, N. Y.